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Contributions

The Miller Locomotive Cab Signal Again.

To the Editor of the Railroad Gazette:

A "Seeker After Information" has asked several very pertinent questions about the Miller signal in his letter published in your issue of March 14th, and it is to be hoped that the questions asked will be answered by one of those who are in a position to give the information. Although it may be possible to successfully insulate one tender truck from the wheels of the engine, it has been reported on reliable authority that considerable difficulty had been experienced in getting the insulation to last for any length of time, and that this matter of insulation was a serious objection to be made against the use of the system.

But questions in regard to insulation and the battery to be employed are those that have to do with maintenance rather than with reliability and safety. If the system is not so designed or constructed that a failure of the apparatus will give a "red" or "stop" signal, all questions in regard to maintenance become of secondary importance. With all the successful automatic signal systems that are in service to-day it is a recognized principle of their construction that a failure of any part of the apparatus will result in the signal being changed to or held in the stop position until the parts are repaired. Where this fundamental principle is not followed, an accident will almost surely result; as, with any apparatus, no matter how well constructed, failures may be expected. And when one should occur, if a clear indication is displayed instead of a stop signal, the condition is very much worse than if there were no signal at all for the train to be governed by.

S. A. I. touches on this when he speaks of a "weak point" in the system; but the trouble is not that the wheels may not make contact with the rails, for this can be guarded against to a great extent, but in the fact that the opposing ends of the magnets of the polarized relay are of the same polarity, and it is necessary for a current to pass through the solenoid to make a change of the armature from one side to the other to effect a change from a white to a red light. If the polarized relay were designed on the "normally danger" plan, where a failure of any part of the signal circuit would result in the armature falling normally over to the "red" side, a failure of the wheels to make contact on the rails, or of other parts of the apparatus to properly perform their function would result in the red or stop indication being given, and the failure would be on the side of safety; no dangerous condition would exist. So long as a possible failure of the apparatus, and one that is very likely to happen, will result in a clear signal being given when a train is in the block, the system cannot be said to fulfil the first requirement of a safe signal; and unless there be more to the system than has been published, it is not to be expected that signal engineers will recommend the system for adoption.

Another point to be brought out is that when a part of the engine apparatus has failed and a red light is given, the train has to go for the entire length of the engine-run without any indication and no protection from the signal system, although thousands of dollars may have been spent in its installation. In case of a failure of the apparatus and a red light is shown, would it be safe to run a train through to destination, or would another engine have to be provided? If the trains are run entirely on the indication given by the Miller signal, as they are by other systems, a failure of the Miller signal would make it necessary for a train to tie up or else run so slow as to seriously delay traffic.

An objection to be urged against the system from an operating standpoint is that with the indications given in the cab, there is no way of telling whether or not the indications are being obeyed. It has been the experience of most roads, and certainly those in the West, that without inspection and an occasional test, engineers will disregard the indication of the signal, particularly if it happens that they think they can gain anything thereby. If the automatic signal would never fail or if a train were never stopped by a signal unless the enginemen knew that there was a train in the block, it is very probable that the signals would be observed more carefully than seems to be the case, but where there are so many stop indications met with for which the engineer cannot be sure as to the cause, he is apt to lose faith in the signal and to take chances. And knowing that an engineer will take chances, especially when it is not possible to have a check on his actions, it cannot be considered advisable, from an operating standpoint, to put in any system of signals which will give an indication only to those in the cab of the engine. Many operating officials urge as an objection against the use of an automatic signal the fact that there is no regular check on the engineer, so that in case of failure to obey the signal there is no report made. To appreciate the strength of this objection, it is only necessary to read the testimony given by trainmen in most of the derailment cases occurring at interlocking plants. Although it may have been a physical impossibility, from the use of electric locking or other safety appliances, for the signalman in the tower to have caused the derailment of the train, the "testimony" given will, in many cases, go to show that the train crew were not at all to blame, but that the derailment was due to the derail having been opened after the signal had been cleared for the train to proceed.

To one who has had much experience riding on engines the putting of an additional light in the cab will be looked upon as very objectionable, even if it be a shaded light. It is necessary for the engineer to see as much as possible of the track ahead, and a light inside, reflecting against the windows and the walls of the cab, will materially interfere with what can be seen outside. Then again, an engineer is looking out the greater part of the time, particularly on fast trains, and is not so apt to notice a change in the light as he is to get the indication of an outdoor signal that he is approaching. With the outside signal, the indication is given before the signal is reached, and the engineer can govern himself accordingly, while with the lights in the cab the engineer or fireman must be looking at the lamps at the time the change is made in order to get the full protection afforded by the system.

SIGNAL ENGINEER.

Du Bois' "Mechanics of Engineering."

New Haven, March 21.

To the Editor of the Railroad Gazette:

In the review of my "Mechanics of Engineering," Vol. I, published in your issue of March 14, the reviewer states that from an "engineering point of view" his "impressions are not favorable." I would like to make a few comments upon the reasons he gives as the basis of this unfavorable opinion.

He objects to the use of the poundal, as it "seems to introduce obscurity rather than clearness, especially as engineers never use poundals." I do not "use" poundals except incidentally to make clear to the student just how the gravitation measure of force comes in. The question is analogous to the use of horse power in mechanics. The pound, foot and second once assumed as units, the derived unit of power becomes of necessity one foot-pound per second. This, however, is for commercial purposes too small, so the horse-power (or 550 foot-pounds per second) is taken as a commercial unit. It does not "introduce obscurity" to thus explain the introduction of the horse-power unit, nor is it difficult for the student to comprehend that he must first get his power in foot-pounds per second, and then divide by 550.

The poundal question is precisely analogous. The pound, foot and second once assumed as units, the derived unit of force becomes of necessity the poundal. This, however, is for engineering purposes too small, so the weight of a pound $(1 \times g)$ at some given place is taken as a more convenient unit for practical purposes. Why should it then cause in this case, more than in the other, any obscurity to thus explain the introduction of the gravitation unit, or why should it be difficult for the student to comprehend that he must first get his force in poundals (the product of mass and acceleration) and then divide by the weight of one pound, or $1 \times g$?

Twenty-five years experience as a teacher has convinced me that obscurity is thus avoided. I have received many letters from readers, brought up in the old school, in commendation, and stating that for the first time it is clear just why and how that "mysterious g" is always jumping in and out. The general kinetic equations are, by the introduction of the poundal, made truly general and independent of the accidents of locality, latitude and sea level. The physicists have long adopted the poundal, and all our students become necessarily familiar with it in their physics instruction. Is it not advisable that what is taught in one class room should be recognized in another? Ought not a well constructed course to be consistent throughout? Is it not a little too late in the day to condemn a modern engineering work for being up to date in this particular, or to make it a crime for me to so much as mention the poundal, even though gravitation measure is "used" throughout my work? Can the *Railroad Gazette* afford to stand for such criticism?

Your reviewer also objects that I take clock-wise rotation as negative, and says that this is "contrary to usual practice." I can only say that as I have taken it, I am in accord with the universal and world-wide accepted conventions of mathematical mechanics and your reviewer is not. According to these conventions, positive rotation in the x y plane is always from x to y; in the y z plane, from y to z; in the z x plane, from z to x. Also in co-planar work the plane assumed is always the plane of x y, as witness any work on Analytical Geometry.

These conventions are held throughout my work and your reviewer fails to see that I cannot violate them without inconsistency and resulting confusion. Since, then, I take for my co-planar work the x y plane, I am forced to take positive rotation from x to y or counter clock-wise. I could have taken my co-planar work in the z x plane and accommodated your reviewer as to the direction of positive rotation. But he would then have found my equations strange, since I would have had z where he is accustomed to see y. For it is a lamentable fact that many of our authors upon the theory of flexure take rotation positive from y to x in the x y plane, thereby violating universal convention. Hence your reviewer's criticism. He follows these authors without knowing better. But I am really not to blame for this. The conventions are as I have stated, as every one of your readers who may see these lines will admit, when he thinks of it. In a special treatise, violation of such conventions is of little practical importance, but it is impossible to do so consistently in a comprehensive work. It is in any case a very small point upon which to base an unfavorable opinion.

Your reviewer states that the principle of least work is "of doubtful utility for the use of students" because "it is not a general law of nature, but a special law applicable only to materials which obey Hooke's law of the proportionality of stress to strain." I fail to see the connection. Of course the principle only applies to elastic bodies. I have shown this in my work. But I had supposed that within the elastic limit, such bodies obey Hooke's law. The principle is very simple, it applies wherever the theory of flexure applies and its utility is precisely co-extensive with that theory. I protest against such ill advised attempts to make a mystery of it.

Your reviewer objects that I give a coefficient of rupture for wrought iron which he says "cannot be broken by bending." This is indeed good news for the engineer. For if wrought iron "cannot be broken by bending," a wrought iron beam is, according to your reviewer, capable of carrying any imaginable load without being "broken." Until this good news is confirmed, however, I shall continue to follow the example of every authority on the subject I know of, and give a coefficient of rupture for wrought iron.

Your reviewer corrects some tabular values and statements, such as "that one gallon contains 277.274 cubic inches, and that one gallon of pure water weighs 10 pounds!" For all such corrections I am thankful, but would it not have been as well to add that the statement is quite correct for British units, is found in a hastily constructed table of weights and measures, is not used anywhere in the work itself, and that such blemishes are unavoidable in a first edition and possess no value whatever in an estimate of the real merits of any work.

For a work like this is an organic whole, and its parts, the relations of its parts to the whole and to each other, and their adaptation to the end, as well as special comparative excellencies, are some of the points of importance in any judicious estimate.

Suppose you were to ask an expert opinion on a new make of bicycle, and should get something like the following: "From an engineering point of view my opinion is not favorable. There are several rust spots on the rim. The spokes are in tension, which is contrary to the 'usual practice' in ordinary cart wheels. Forward motion is produced by pedals, a principle of 'doubtful utility,' because it is 'applicable only' in cases where a crank is used. The maker states in a circular that a gallon of pure water weighs 10 pounds!"

I leave it to your readers whether this is a parody or a parallel.

A. J. DU BOIS.

Errors in Calculating an Average Per Diem Rate.

March 22, 1902.

To the Editor of the Railroad Gazette:

Mr. Midgley has got out another letter (No. 9) to the railroads for which he is acting. He undertakes to show the average miles per car per day as affecting per diem. This question seems to have endless possibilities of confusion and a number of transportation men have been misled

into basing the rate per day on the average miles per car per day at the 6 mill rate.

While averages are in some instances a fair basis on which to make comparisons, they are not always so. Some years ago I was connected with a road having docks where iron ore and coal vessels landed, some of them drawing 19 and 20 ft. of water. One boat, having more than the usual draft of water, when landing scraped the bottom. The captain complained to the superintendent and threatened to notify his owners not to accept cargoes for that port until it had been properly dredged. The superintendent asked what draft of water he required, and on being informed 22 ft., immediately took out his marine charts and undertook to convince the captain that the slip was all right, showing him in places 40 ft., 35 ft., 30 ft., 25 ft. In only one place was it 20 ft., and even with this the *average* depth was proved to be 30 ft., or *eight feet more* than he required!

That superintendent was the kind of man that we have in some car service offices. He would average the entire miles made by cars both at home and not at home when he ought to consider only the use of cars when away from home.

A New York bank having a surplus of $1,000,000 loans $250,000 in Canada at 2 per cent., and $750,000 at home at 6 per cent.; the average rate of interest would be 5 per cent. The directors in looking over the accounts call attention to the fact that the bank is losing money on the Canadian loan. If the president undertakes to convince them that it is all right because the average rate received from all is 5 per cent., enough to give a handsome profit, he will not be likely to succeed. So with the average performance of cars *as affecting per diem.*

It has never been questioned that railroad companies' cars have always run greater average miles per car per day at home than when away from home. This is due to various reasons. 1. They receive preference in long haul freight; 2. They receive preference in repairs at shops; 3. Coal cars, flats and special cars are hauled sometimes long distances to protect the traffic originating on the road owning them, whereas when away from home there is no coal or load for the coal and flat cars, and they stand empty until the train conditions permit of moving without increasing the engine mileage.

Now, when considering the question of per diem, deal with it on its own merits, divorced from home service. If it is shown that the average mileage of railroad companies' cars at home and abroad is 25 miles per car per day, then the mileage away from home is less than 15 miles per car per day, as has been shown from actual data compiled by roads in different sections.

The necessity for the adoption of per diem was not made manifest by reason of delay to cars while in possession of roads owning them, but the plan is presented with the view of increasing the movement of cars when away from home.

This rate per day should be based on the actual interest on the investment, coupled with the earning capacity of the car to the road owning it during the time of its absence. We must consider fully the fact that the borrowing road is at liberty to transfer freight from foreign cars into its own, and thus prevent per diem accruing. This is the practice on a great many roads during the dull months, when roads owning a large equipment would prefer to send cars through in order to get mileage earnings. But in the busy season, when the road requires the cars to protect the traffic for which it built them, the borrowing road insists on running them through; and as we know, in a great many instances it will put them into strictly local service, the freight earnings of which the road owning the cars does not participate in.

Again, in basing the car rate, due consideration should be given to the fact that roads are forced to build large numbers of cars in order to protect the maximum tonnage offered them during six or seven busy months each year, well knowing that they will be obliged to store them during the dull months.

Now, if it is decided that $60 per annum is a fair amount for interest and depreciation per car, then, instead of basing your rate on $5 a month, name the rate on seven months, that is $8.57 per month, on the same principle as a bank would loan money.

If, as shown in the illustration, the Canadian bank tried to borrow during the high money market and offered to pay 2 per cent. interest, when the bank loaning the money could use it in its own territory and earn 6, 7 or 10 per cent., its application would be very quickly turned down.

Borrowing roads will in every possible manner avoid using cars in the dull season, and will take every advantage of per diem to hold and misuse in local service foreign cars during the busy season. The rate should be sufficiently high in order to compensate the owner, in part at least, for his investment; and in order to prevent either the lender or the borrower from gaining an advantage, arrangements should be made for a free and equitable interchange of cars, with the view of balancing the accounts as far as possible by the equal interchange of equipment, as is done in through passenger service over two or more roads.

AUDITOR.

The Bavarian State Railroads have long granted free passes for Easter and the long vacation to children of their employees, when such children attend school away from home, because suitable schools do not exist where the employees live. This year for the first time this privilege is extended for the Christmas vacation also.

Objections to a Low Per Diem Rate.

Mr. J. W. Midgley, of Chicago, has written a letter on this subject, from which we extract the following paragraphs:

The average cost of cars is more than double what it was eight or ten years ago. It will, within a year, approximate $1,000 per car instead of $350 to $450, as it did in the early '90's. It is an error to assume that an average of 35 miles per day would be satisfactory, or that standard box cars can be obtained by companies that are not in position to reciprocate, on the basis of 25 cents or 30 cents per day, for such period as the borrowers may desire. It is usually switching, belt or industrial roads that raise this question; but when those companies are obliged to account for foreign cars pressed into local service, or have to rent them for their own use, they rarely obtain them at less than 50 cents a day, while not infrequently they have to pay 75c. to $1.00. If the adoption of per diem does not result in quickening the movement of cars to a daily average of 40 miles, it will not repay some companies for the trouble and expense that must necessarily attend its inauguration.

There are railroads whose favorable location enables them to average 35 miles per day with their own cars. Doubtless they would not be satisfied with an increased activity of less than 30 per cent. That would exceed 45 miles per day, which at ¾c. per car would equal 34c.; therefore a rate of 35c. per day for the standard car is as low as such lines should be asked to accept. Because certain roads that are largely dependent upon others for cars have long had an unfair advantage, is not a good reason why they should retain it. The only equitable basis of car rental is one that will approximate the cost of ownership. If an unprofitable rate should prevail, it might result in large owners declining to loan their cars to habitual borrowers; if borrowers should decline to pay rates based on expense of maintenance, they would be confronted with the alternative of acquiring enough cars with which to do their business.

The average gross revenue per car per day for the year 1900 as published by the *Equipment Register* was $2.10. That estimate was based on 1,365,531 freight cars that were then in regular service. The average stated includes all classes of freight cars, also dull as well as busy seasons. While no rate per diem that might be suggested—not even 50c., 75c. or $1.00 per day—would compensate a railroad company for the relinquishment to a borrowing road of its equipment in the busiest seasons, prices should be named which will bear some relation to the average economic value of the car to the owning railroad.

The average cost of a car and its maintenance in good condition should be the controlling factor in determining the rate of rental for its use. This cost includes cost of car, interest on the same, depreciation and repairs. Place the interest at $50, depreciation at $60, and repairs at $40, and the total would be $150 per annum, to defray which would require a rental of fully 40c. per day. I do not put this forward as the precise rate which should be charged for the use of standard cars, but merely advance some reasons that would justify its adoption. The average cost of the standard car will, within a year, be about $1,000, and interest thereon at 5 per cent. would not be unreasonable, thus creating the first item. The second results from the M. C. B. allowance of 6 per cent. on cost for depreciation; and repairs are generally stated at $45 to $65 per car, though they are here estimated at only $40. There are other items which should be taken into account, such as taxes and the proper distribution of salaries and office expenses of those who are employed in looking after cars.

I have previously contended for graduated per diem rates, based on the varying capacity of the cars, and it will be enough in this connection to express renewed adherence to that opinion.

Elasticity in Draft Gear.*

The primary purpose of what is now called the draft spring was to avoid, as far as possible, the blows and shocks which vehicles suffered in coming together; that is, it was simply a buffer spring. Owing to the difficulty of avoiding slack in car couplings and to the practical necessity of such slack for starting trains of considerable length, and because of the shocks in starting trains of vehicles between which such slack exists, it early became evident that a draft spring is also required.

It was not until power brakes came into regular operation upon long freight trains that the varied service required of draft gear became generally apparent. Let us suppose the case of a freight car, weighing 30,000 lbs., being switched, at a speed of seven miles an hour, upon a track where it meets a similar car at rest. At the instant when the maximum pressure of the resulting impact occurs between the cars, both will be running at three and one-half miles an hour and the mechanical energy that disappears during the brief operation is about 24,600 ft. lbs. The disappearance of this mechanical energy is necessarily attributable to the operation of the draft gear, which must absorb about 24,600 ft. lbs. of work to prevent the injurious effects of direct impact upon the car structures. The permissible movement of the draft gear is limited to about 2½ in. upon each car, so that the cars may approach during the operation through a distance of only about $^5/_{12}$ of a foot, and an average resistance of about 59,000 lbs. is necessary to effect the desired result. If a spring, or a combination of springs, be employed upon each car, for the purpose of providing this resistance, it is clearly necessary that it shall offer a final resistance of about 118,000 lbs., that the average resisting force shall be 59,000 lbs. The use of a spring, or a combination of springs, which will offer so great a resistance through a compression of 2½ in., is not an altogether simple solution of the problem. The difficulty of supplying springs to meet such a demand is obvious. The ordinary draft spring has a movement of about 1¾ in., and, when compressed, offers a resistance of about 20,000 lbs. The mechanical energy that may be absorbed by two such springs, as they operate together in service, is about 2,900 ft. lbs. Eight such springs at each end of each car would be insufficient to meet the requirements of the conditions of the case cited.

If, therefore, providing draft gear with sufficient movement and resistance to absorb the mechanical energy of impact between cars, were all that the case demands, it would not be easy to meet the requirements by ordinary means, but such is far from being the case. We have followed the illustration of the impact between the two cars only to the point where the pressure between them having reached a maximum, the two are moving at a common speed of 3½ miles an hour. In every ordinary case of impact, the pressure between the colliding bodies regularly, though with great rapidity, increases from the instant of initial contact to a maximum, at which time the two, or at least the portions of their material near the surface of contact, are moving in unison. This operation is inevitably accompanied by compression and more or less distortion of form of the bodies. It is only possible for the two bodies to continue to move on with this common velocity when such distortion is permanent, or, in other words, when the compressed material is absolutely without elasticity. If the compressed material be elastic, immediately after the maximum pressure occurs, the material begins to return to its original form, with a corresponding decline of pressure, until the two bodies are wholly or partially restored to their original forms and are moving again at different speeds. If the compressed material, whether that of the cars themselves or of the draft gear between them, could be endowed with perfect elasticity, the two would finally separate with the switched car standing still and with the previously standing car now running at a speed of seven miles an hour. That is, they would simply have exchanged their velocities and their kinetic energies.

This is a matter for serious consideration under certain conditions of train operation. Of course no such things as perfectly elastic or perfectly inelastic substances exist. Nearly all mechanical energy absorbed by a spring is but temporarily stored until the conditions are such that it may be discharged in performing some kind of work. In the case of springs used in draft gear, that work can generally be performed only in causing motion. The effect of this characteristic is well illustrated in its relation to an emergency application of the brakes upon a long train.

The characteristic operation of the air-brake in an emergency application is well understood. Notwithstanding the almost inconceivable rapidity of serial application of the brakes throughout a train, the small interval of time required permits the retardation to begin at the forward end of the train and to progressively multiply during the first two or three seconds, thus closing up the train, at first gradually but with increasing force toward the rear of the train. This force is sufficient to completely close the ordinary draft spring a few cars back of the forward end of an empty freight train and to close springs many times stronger at the rear end of such a train of but ordinary length. At speed as low as 20 miles an hour, the train comes to a stop before sufficient time has elapsed for the energy thus stored by the draft springs to become released; but at the higher speeds, the brakes having once become fully applied throughout the train, the force with which the cars are forced apart by even ordinary draft springs, is sufficient to almost certainly result in parting the train. In a series of air-brake trials, 13 experimental emergency stops of an empty train of 50 practically new cars, were made from a speed of about 40 miles an hour, upon a level track, with the result that the train parted in 12 stops and in two different localities in two of the 12.

While it is obviously of high importance that draft gear shall be provided with the capacity to absorb many times the mechanical energy of impact provided for by the ordinary draft spring, considerations of the character illustrated by the results of these emergency stops seem to as clearly indicate that the impact should be, as far as possible, inelastic. This conclusion is further emphasized by the fact that under similar conditions (and indeed under even much more trying conditions) it has been found practically impossible to part trains equipped with friction draft gear, which is yet capable of absorbing the 24,600 ft. lbs. of energy expended in the impact of the cars in our switching illustration.

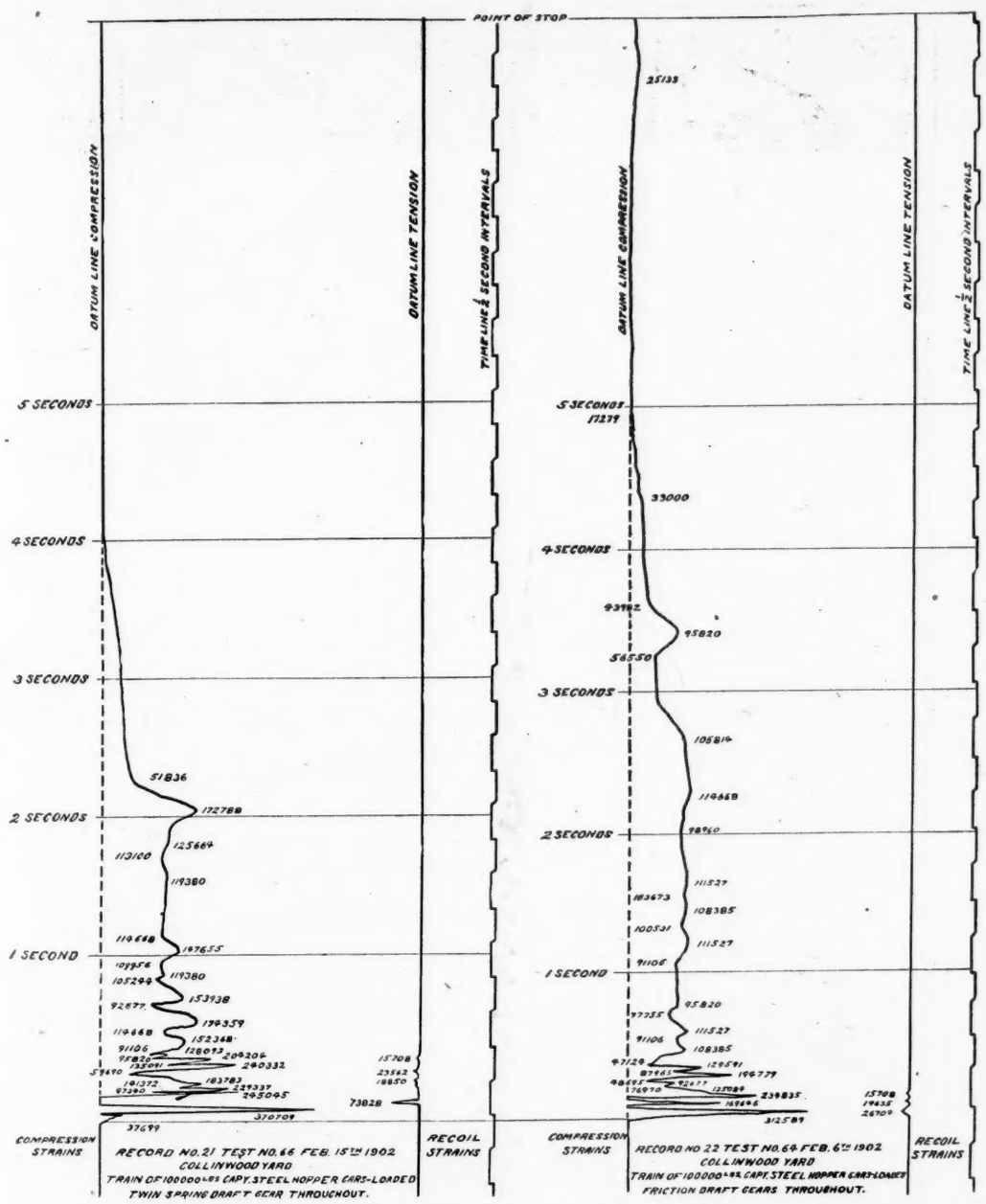
There is still another important influence of draft gear upon train operation to be considered, which is as yet very obscure and which is not easily brought within the range of actual determination or measurement. This is loss of mechanical energy through vibrations which the draft gear may or may not cause to extend through trains. The subject of impact is a most difficult one to treat and one of which our knowledge is very limited. The time occupied in its operations is so brief that the determination of the actual forces involved is, to say the least extremely dif-

*Extracts from a paper presented by Mr. R. A. Parke, at the March meeting of the Railway Club of Pittsburgh.

ficult, and we have generally been obliged to content ourselves with consideration of what is termed the impulse, or the measure of the momentum lost by one and gained by the other of the colliding bodies. The accompanying illustration is from diagrams taken from the recording apparatus of a dynamometer car arranged to record the compression and recoil strains transmitted through draft gear of trains. The nature of the diagrams indicates the methods used and the apparatus was calibrated under conditions that were known.

The conditions under which these diagrams were taken are as follows: The dynamometer car was placed at the rear end of a train consisting of a locomotive and a number of loaded cars. The train was then backed and, at some speed, coupled to as many standing loaded cars as there were in the train, the dynamometer car being thus between the moving and standing loaded cars and registering the stresses upon the drawbar. The diagram at the left is taken from a test in which the train consisted of the locomotive, tender and thirteen loaded, 100,000 lb. capacity, steel hopper cars, each fitted with the twin-spring type of draft gear, followed by the dynamometer car. The thirteen loaded cars, together with the locomotive and dynamometer car, weighed 1,077.8 tons. The thirteen stationary cars were of the same kind in all respects as those in the train and with load, weighed 661.8 tons. The speed of the train, at the instant of coupling with the standing cars, was 4.71 miles an hour.

The diagram at the right was taken from a test in which the train was composed of the same locomotive, tender, 20 loaded steel cars and dynamometer car, the loaded cars being of the same construction and capacity as those of the first test, except that all were equipped with the friction draft gear. This train weighed 1,270.06 tons, and was coupled, while running at a speed of 5.18 miles an hour, to 20 standing cars of the same kind, equipped with friction draft gear and weighing, with their loads, 1,103.55 tons. The diagram, in each case, records the stresses upon the drawbar of the dynamometer car from the time of initial impact until the trains came to a stop. For convenience of reference, the datum line of the pressure diagram has been extended below the line traced by the pencil and the more pronounced variations of pressure are indicated by figures obtained through measurement of the original diagram. It will be observed that the diagrams differ very materially in respect to the record of pressures upon the drawbar. They differ with respect to the intensity of the initial impact and with respect to the intensity, frequency and character of the later vibrations. If the colliding masses be regarded as single bodies in impact, the loss of mechanical energy at the instant of maximum pressure during the impact of the train with twin-spring draft gear, is 608,420 ft. lbs. The loss of energy to the train with friction draft gear, at the corresponding instant, is 1,059,770 ft. lbs., so that, under conditions of ordinary direct impact, the maximum pressure between the colliding bodies would be 74 per cent. greater for the train with friction draft gear than for the other. But, as already pointed out, and as clearly demonstrated by these diagrams, the two sections do not come together in any such impact, but, regardless of the number of cars in either section, the initial impact, is practically only that which would occur if two detached cars came together at the same speed.



Dynamometer-Car Diagrams from Draft-Gear Tests.

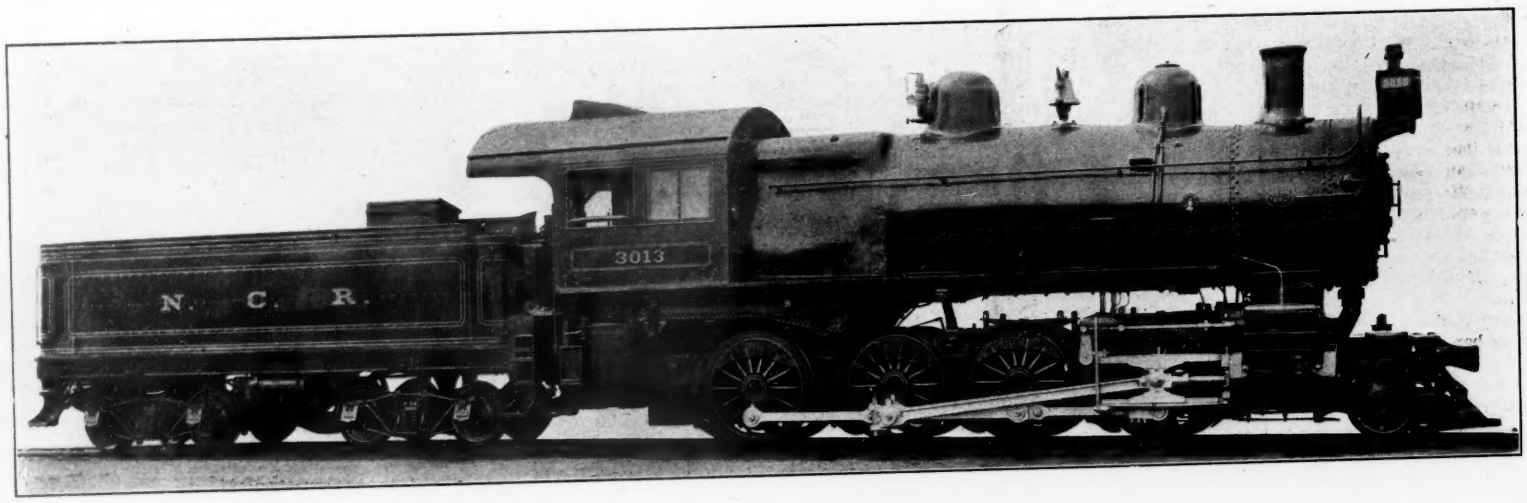
The average weight of the loaded cars equipped with the spring draft gear is determined from the 13 standing cars to be 101,800 lbs., and the average weight of those fitted with the friction draft gear is similarly found to be 110,350 lbs. Regardless of the ultimate speed of the whole mass after the two sections are coupled together, that of two single loaded cars of the same weight, colliding with a relative speed of 4.71 miles an hour, would, at the instant of maximum pressure, be 2.355 miles an hour and the loss of mechanical energy, due to the impact would, at that instant, be 37,760 ft. lbs. Similarly the loss of energy of impact between two loaded cars of the train with friction draft gear, colliding at a relative speed of 5.18 miles an hour, is at the instant of maximum pressure 49,510 ft. lbs. Whatever maximum pressure results from the impact in the first case, the conditions in the second case, except for the influence of different draft gear, should result in a maximum pressure about 31 per cent. greater. By referring to the diagrams, however, it will be seen that the maximum pressure of initial impact was 370,709 lbs. in the case where the train was fitted with the spring draft gear, while but 312,589 lbs. in the case where the cars were fitted with the friction draft gear, or but 60 per cent. of what should be expected if the two draft gears were equally effective.

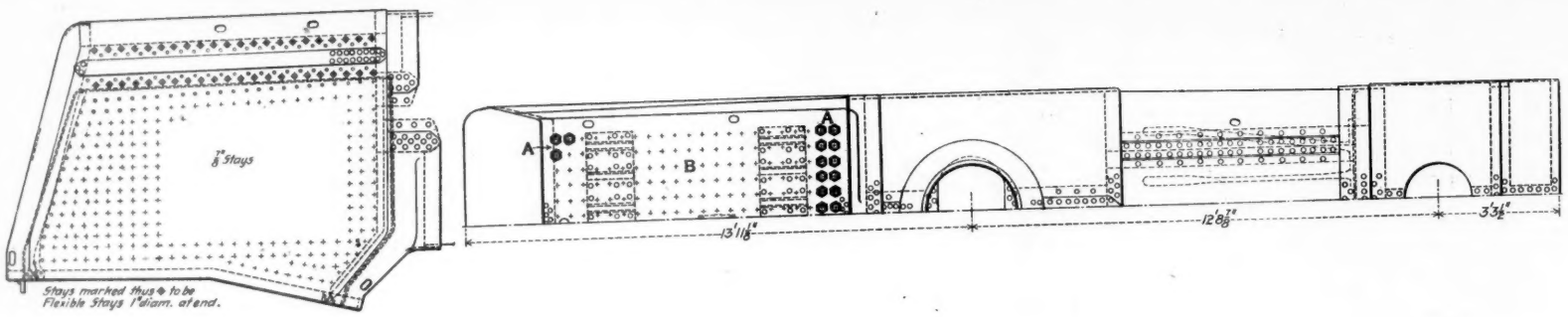
The character of successive events, as indicated by the diagrams, is clearly defined and very interesting. In the case of the test with spring draft gear, it will be observed that, first of all, a pressure upon the drawbar of 37,699 lbs. occurred. This would seem to record the first operation of the spring draft gear between the cars coming into initial impact. The resistance of the draft gear being then exhausted, the direct impact between the cars resulted in the sudden increase of pressure to the maximum of 370,709 lbs. The apparent drop of the pencil to the datum line between these two events is difficult to explain, more particularly as the corresponding operation, where the friction draft gear was used, is without any indication of the point at which the resistance of the draft gear became exhausted. Immediately after the initial impact, the diagrams show that the drawbar suffered a tension, which, in the case of the spring draft gear, was 73,828 lbs. while, with the friction draft gear, the tension was but 26,704 lbs. Subsequent impacts were followed by similar tensions upon the drawbar, though of decreasing intensity, regular in character with the friction draft gear, though somewhat irregular in the case of the spring draft gear. These tensions, of course, mark the effect of the restoration of energy during the periods of restitution and clearly distinguish the difference in elasticities of impact in the two cases. The later impacts and the effects of superposition of impulses is very interestingly exhibited in both diagrams, the very material influence of the character of the draft gear upon the intensity and number of the vibrations being clearly shown. The notable differences in the chief characteristics of these diagrams are peculiar to the use of the two different types of draft gear, each being a representative diagram for the use of the type of draft gear employed in the train from which it was taken.

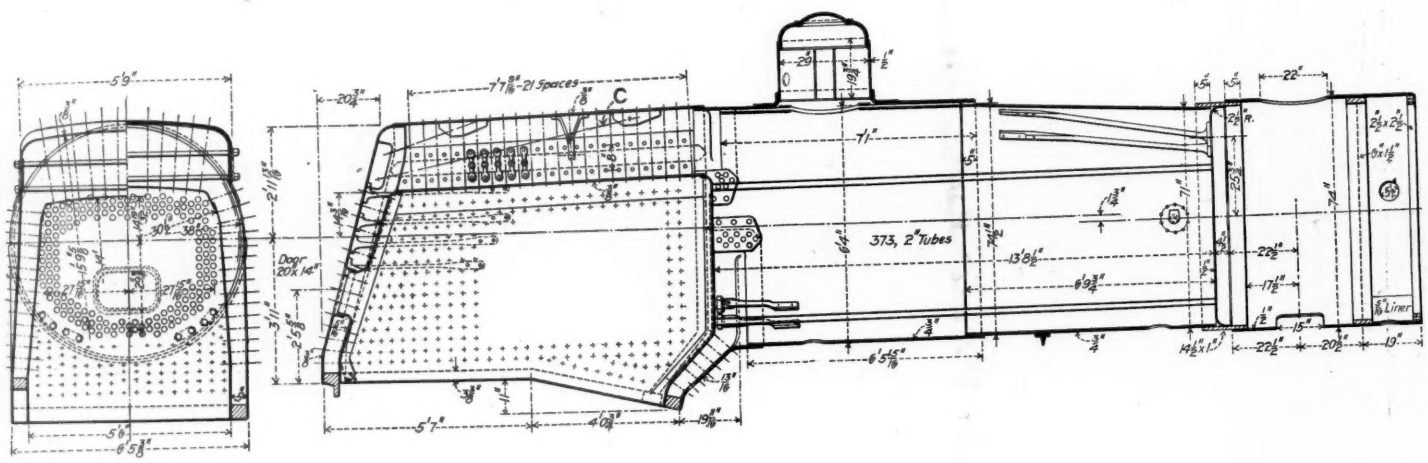
It will be observed that, in each of these diagrams, the maximum stresses upon the drawbars considerably exceed the limit of resistance which the draft gear is capable of withstanding; that is, the draft gears were exhausted and the car structures suffered more or less from direct impact. In the spring draft gear, the maximum pressure appears to have been a considerable number of times greater, while in the friction draft gear, it is about double the capacity provided. Had each draft gear been capable of offering a resistance sufficient to prevent direct impact, it seems quite certain that the total number of vibrations and the number and intensity of the tensions would have been multiplied, in the case of the spring draft gear, while they would have been correspondingly reduced with the friction draft gear.

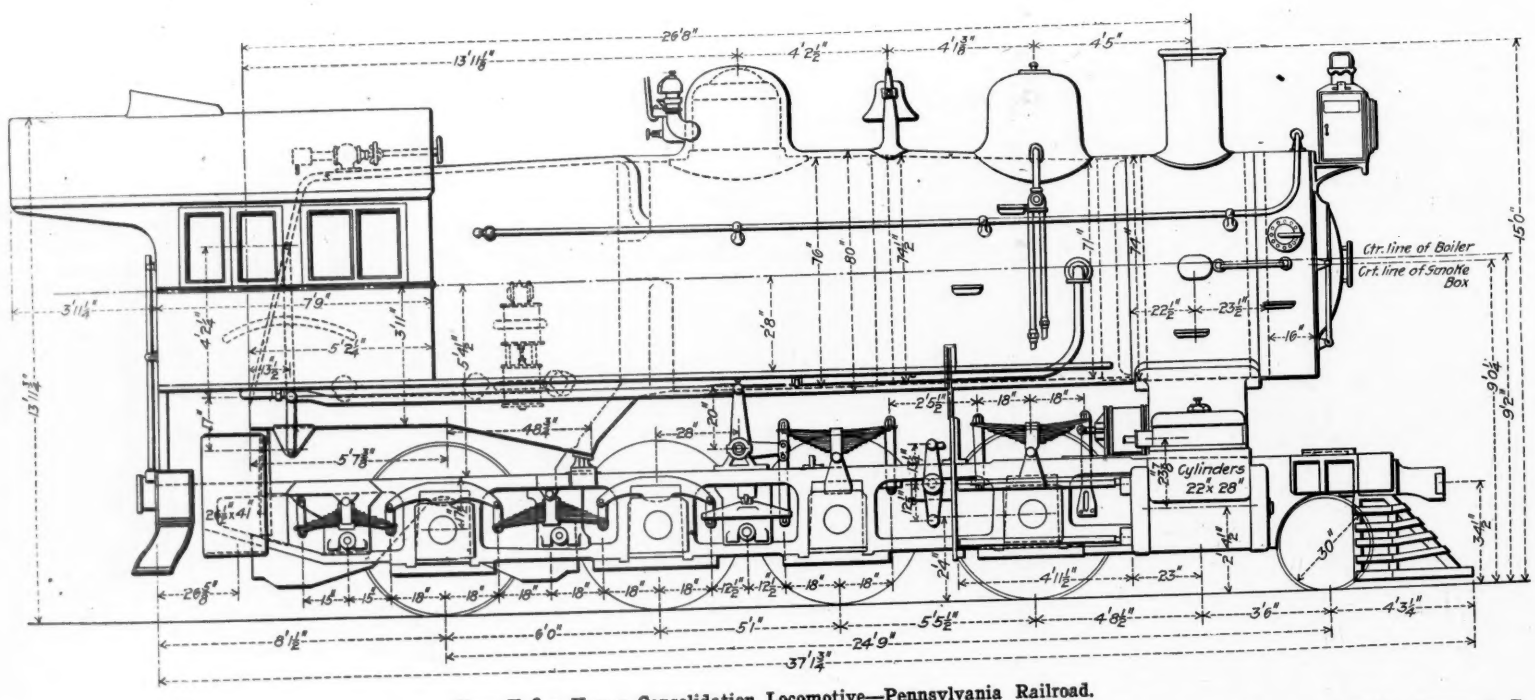
A chiefly interesting effect of the vibrations thus set up throughout a train by impact is their influence in starting. In that case, the initial strain upon the drawbar is one of tension and, in intensity, it more nearly falls within the range of the resistance which the draft gear is capable of offering; in fact, it falls well within the maximum capacity of the friction draft gear. In starting trains, the effective application of the force of the locomotive to the acceleration of the individual cars is very seriously disturbed by vibration. The avoidance of direct impact is of high importance but not more so than is the absence of vibration. Where vibration occurs, not only is the applied force partially expended in the dissipation of energy through such vibration, but, when various individual impulses become superposed, the combined result may wholly vitiate the effort and altogether prevent motion. This is readily verified by observation. It is frequently to be observed that, where heavy locomotives attempt to start long trains, the initial effort, apparently successful for a short distance, is suddenly met by a reactive impulse from the rear toward the forward end of the train, which results in an abrupt stop. On the other hand, of course, the contrary is also true. In some cases, an effort, promising at the outset, appears to be gradually overcome when the combination of individual impulses results in an accelerating impulse which, upon reaching the stalled locomotive, suddenly causes it to successfully start, forward and get the train under headway. A total absence of vibrations of this character can hardly result otherwise than in enabling a locomotive to start a longer and heavier train than could occur where such vibrations accompany the locomotive effort. Vibration is inevitably inimical to the application of power and cannot exist except at the expense of energy. The complicated character of the diagrams illustrated seems to defy analysis or the determination of such definite characteristics as may lead to a clear knowledge of just what takes place throughout a train. But comparison of diagrams taken from the dynamometer car in different positions in the train, under conditions as nearly the same as possible, seems likely to furnish information of value in this respect. Those illustrated, however, seem to clearly warrant the conclusions already stated.

In the Prussian House of Delegates recently the State Railroad management was attacked for reducing rates on certain freights to seaports, and thus diverting traffic from river and canal boats. The Minister of Public Works acknowledged that such reductions had been made; it was not to divert traffic from the rivers and canals, but to put places not on rivers and canals on an equality with places which are, and in some cases to facilitate the coaling of steamers, which in this way could take in coal from lighters on one side and at the same time from cars on the dock on the other, thus saving valuable time.









Class H-6-a Heavy Consolidation Locomotive—Pennsylvania Railroad.

Built by the Baldwin Locomotive Works, *Philadelphia, Pa.*

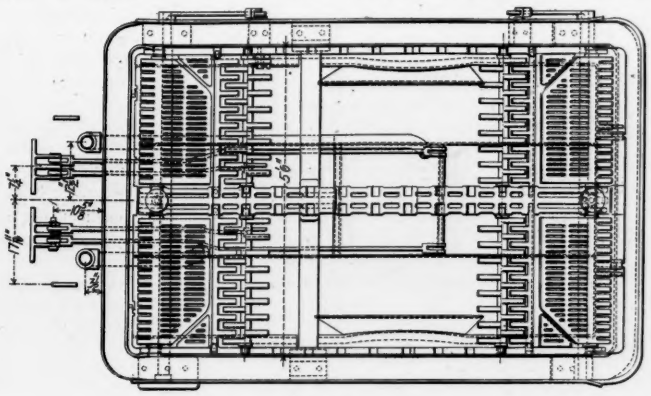
Mr. W. W. Atterbury, *General Superintendent of Motive Power, P. R. R.*

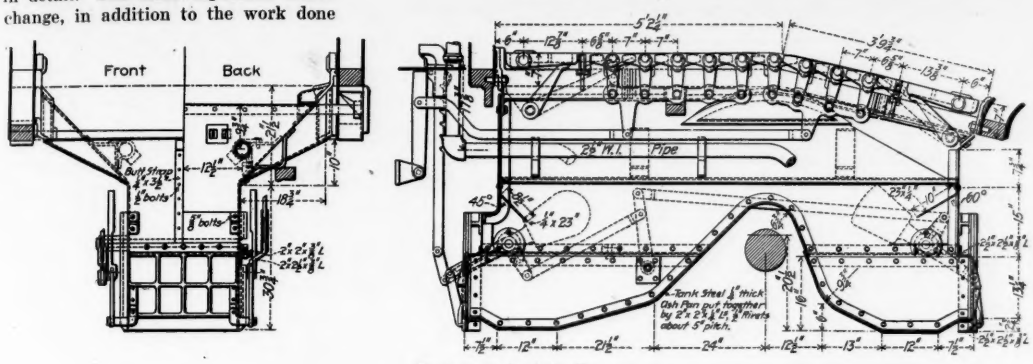
The Class H-6-a Consolidation Locomotive of the Pennsylvania.

The boiler of the class H-6 consolidation freight locomotive of the Pennsylvania Railroad has been remodeled, the principal changes being in the fire-box. The new locomotives are classed H-6-a. The H-6 locomotive has been the standard heavy consolidation freight locomotive of the Pennsylvania for about four years. It was illustrated and described in the *Railroad Gazette*, July 14, 1899, and diagrams were then given comparing it with the class H-5 mountain locomotive, of which it was a development.

The illustrations which we now give show the principal changes, and interesting details will be found in the fire-box and in the stay work; also in the method of attaching the fire-box to the frames. Some of the expansion pads and plates are shown in detail. The most important minor change, in addition to the work done on the fire-box, is in the method of taking steam from the boiler to the bridge pipe. This arrangement was shown with a description of the class E-2 locomotives published in the *Railroad Gazette* Dec. 13, 1901.

The longitudinal stay work above the crown sheet is illustrated, and in connection with this there is an interesting feature of the transverse stays above the crown. Referring to the illustrations, it may be seen that where the transverse stays would ordinarily interfere with the longitudinal stays, a series of yokes is used on the inside of the outer shell of the fire-box and placed as close to the shell sheet as possible. Through each of these yokes two stays pass into the sheets at places corresponding to the location of the double cross stays used at every point except where the five yoke stays are shown. The illustration shows that, crossing from side to side between these yokes, a single cross stay is used. The reason for using the single stay at these points is made clear by noting the position of the longitudinal stays marked C.





Grates and Ash Pan.

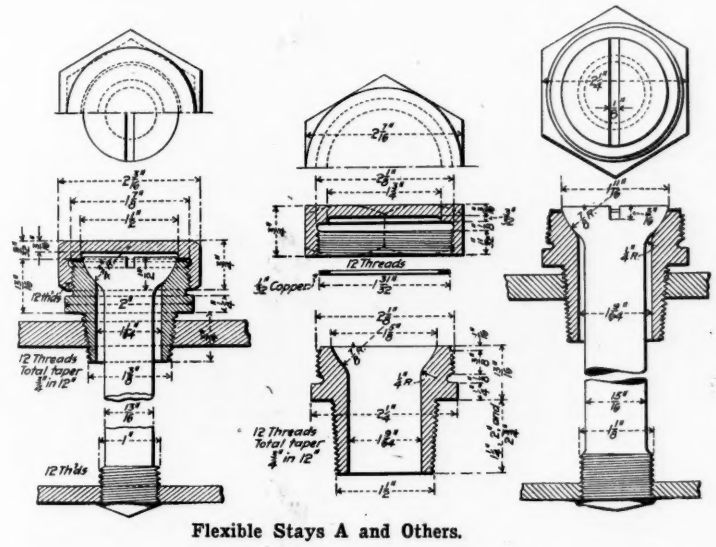
There are shown in plan view the locations of some flexible staybolts, and the detail drawings of these bolts, as well as the stay nuts of the roof sheet, are illustrated with other staybolt details. Reference marks in the illustrations show the location of flexible stays in the side sheets. They are used in the side sheets at back, front and top, and in the throat sheet all stays are flexible.

For ready comparison of the class H-6 and H-6-a locomotives, the principal dimensions, the weight, heating surface, grate area and other important features of both engines are given herewith. The class H-6-a locomotive, as here illustrated, is likely to remain the standard heavy freight locomotive of the Pennsylvania for some time to come.

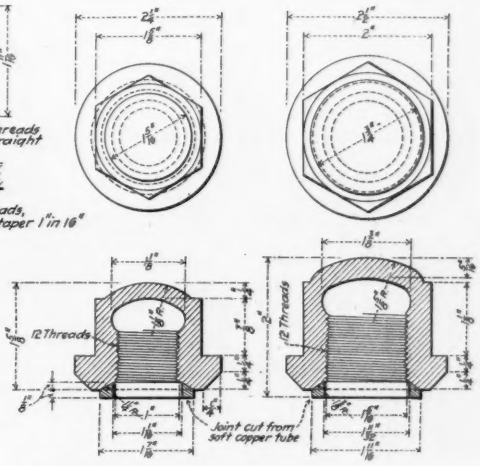
There are now in service, on the lines east of Pittsburgh, 70 of these locomotives, and arrangements have been made to build 186 more of them during the present year. A large number are now being built at the Baldwin Locomotive Works, and we are indebted to Mr. W. W. Atterbury, General Superintendent of Motive Power of the Pennsylvania, and to the Baldwin Locomotive Works for information and materials used in this description.

Comparison of General Specifications.

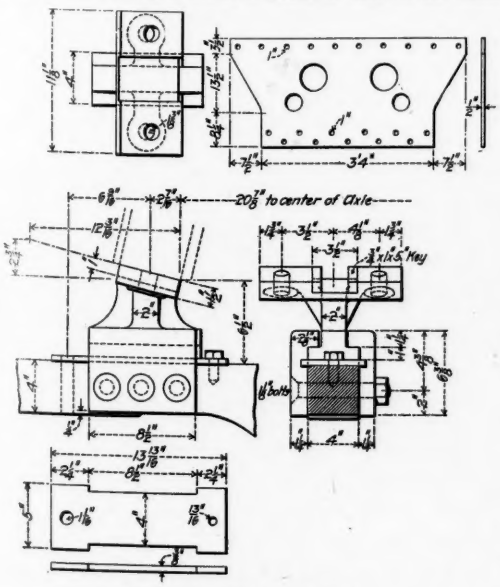
	H 6.	H-6-a.
No. of pairs of driving wheels	4	4
Diam. of driving wheels	56″	56″
Size of driving axle journals	9″ D x 13″ L	9″ D x 13 ″ L
Length of driving wheel base	16′ 6½″	16′ 6½″
Total wheel base of engine	24′ 9″	24′ 9″
Total wheel base of engine and tender	55′ 4½″	58′ 1½″
No. of wheels in engine truck	2	2
Diam. of wheels in engine truck.	30″	30″
Size of engine truck axle journals	5½″ x 10″	5½″ x 10″
Spread of cylinders	88″	88″
Size of cylinders	22″ x 28″	22″ x 28″
Steam ports	1½″ x 21″	1½″ x 21″
Exhaust ports	3″ x 21″	3″ x 21″
Travel of valve	6″	6″
Lap of valve	1″	1″
Type of boiler	Belpaire.	Belpaire; wide fire-box.
Min. internal diam. boiler	69½″	69¼″
Number of tubes	369	373
Outside diam. of tubes	2″	2″
Length of tubes bet. tube sheets	163½″	164½″
Fire area through tubes, sq. ft.	6.36	6.23
Size of fire-box, inside	40″ x 120″	66″ x 107″
Fire grate area, sq. ft.	33.33	49.11
Ext. heating surface of tubes, sq. ft.	2,632.5	2,675.9
Heating surface of fire-box, sq. ft.	180.00	166.5
Total heating surface of boiler, sq. ft.	2,812.5	2,842.4
Steam pressure per sq. in., lbs.	185	205
No. of wheels under tender	8	8
Diam. of wheels under tender	33″	36″
Size of tender truck axle journals	5″ x 9″	5½″ x 10″
Weight of engine empty, lbs.	162,900	171,600
Weight on truck in working order, lbs.	20,100	20,500
Weight on 1st pair of drivers, lbs.	43,800	43,500
Weight on 2d pair of drivers, lbs.	40,200	41,500
Weight on 3d pair of drivers, lbs.	41,500	46,000
Weight on 4th pair of drivers, lbs.	40,900	42,000
Weight of engine in working order, lbs.	186,500	193,500
Weight of tender loaded, lbs.	111,900	134,700
Ratio of heating surface to grate surface	84.36	57.87
Ratio of external flue heating surface to fire-box heating surface	14.62	16.07
Tractive power per lb. of M. E. pressure	242.0	242.0
Tractive power with M. E. pressure equal to ⁴/₅ of boiler pressure, lbs.	35,820	39,688


12 Threads Total taper ¾ in 12″
12 Threads
½″ Copper
12 Threads Total taper ¾ in 12″
12 Threads Straight
12 Threads, Total taper 1 in 16″

Flexible Stays A and Others.



Roof-Stay Nuts as at B.



Expansion-Plate and Pads.

The Prussian Commission on American Railroads.

During the year 1900 a committee of official experts was sent out by the Prussian Government to visit the United States and examine railroad construction, equipment, and management. The commission spent some months in the United States and made elaborate studies of everything pertaining to American railroad building, equipment, and management. These studies were especially devoted to the Pennsylvania system, which was taken as typical.

It can be authoritatively stated that the official report of the commission has been duly made to the Baron von Thielen, Chief of the Prussian Ministry of Railroads, but it has not been published, and, in accordance with the usual practice of the German Government in such cases, will not be. Being consulted in reference to this question of publication, Minister von Thielen has stated verbally, with great frankness and courtesy, that the whole subject was one of deep interest in Germany; that they had learned a great deal from this scientific study which has been the rapid outgrowth of conditions fundamentally different from those which exist in Germany, and upon which the Prussian system had been slowly and carefully built up. Especially interesting and valuable was the American plan of locomotive construction in standard types, with interchangeable parts. Something of this is in process of adoption in Germany.

But in respect to cars, both for freight and passengers, such changes as are made must be planned to fit the conditions existing here, which differ radically from those in the United States. The 40, 50 or 60 ton freight car, for example, is highly economical and advantageous in America, where freight is moved in enormous masses and over long distances. Here in Germany, on the other hand, the amount of freight is much smaller, the distances relatively short, and the need for individualizing shipment so general as to be a controlling factor. The old 10-ton German freight car, says Baron von Thielen, may and will be advantageously replaced by others of 30 tons capacity, but enlargement beyond that limit would involve changes in track, switches, platforms, and especially in the loading and unloading arrangements of mines, furnaces, and other large manufacturing plants, and is therefore for the present inadvisable. The Prussian freight car of the future will presumably have a maximum capacity of about 30 tons, and will run on bogie trucks of the American type.

In respect to passenger cars, the Prussian State Railroads have settled down to a definite model for long-dis-

tance service, viz., the vestibule car, 58 to 60 ft. in length, running on two four-wheeled trucks, and divided into compartments with a corridor aisle running along one side of the carriage. Three Pullman cars of the standard American pattern were purchased and brought to Germany for trial, but although they were admirably built and ran with remarkable smoothness and freedom from jar and noise, they are not liked by the German public, who prefer the smaller compartment which accommodates six or eight passengers and in which, when the train is not crowded, a certain degree of privacy can be secured. The same is true of sleeping cars and for similar reasons. The most popular type of sleepers in Germany is that divided into small compartments, each containing an upper and lower berth, and having a separate washbowl and water supply. American parlor and sleeping cars are, according to German ideas, unnecessarily heavy, richly upholstered, and therefore costly.

Such, in substance, is the judgment of the German experts. That it is a wonderfully efficient and capable system, admirably adapted to a country like ours, where long distances are to be traversed, where railroads are owned by corporations and must be equipped for the sharpest and closest competition between parallel and independent lines, where social relations are based on equality between individuals, and the restrictions of caste do not exist—all this is freely admitted.

But the Prussian system is the property of the State; it has been slowly developed from small beginnings into an organization which pays above its operating expenses not only the entire interest on the Prussian debt, but turns an annual surplus of many millions into the public treasury. That the rates for freight and first-class passenger fares are very high—so high indeed that the former constitute a heavy handicap on agriculture and many inland industries—is unquestionable. German miners and manufacturers look with envious surprise upon the economies of railroad freight in America, and their main hope for the future is in the extension and improvement of the inland river and canal system which is advocated so urgently by the Imperial Government.

FRANK H. MASON, *Consul-General.*

Berlin, February 28, 1902.

Yards and Terminals.*

As indicated in its first annual report, the committee feels that the subject of yards and terminals is such an important one that it is clearly its duty to cover it in a general way, by giving brief descriptions of the various important features and, in a broad manner, to define or outline the rules and principles which should primarily be considered in the design of yard and terminal facilities. The committee, in following this idea in its first report, submitted a list of terms and definitions, a description of a cluster (general yard) and an outline of the principles governing its design. The committee, in its present report, submits two plans, each showing a type of cluster (general yard) as outlined in its first report. It also submits a description of the following features and an outline of the principles governing their design: Freight-car repair yard; passenger-coach and car-cleaning yard; inbound freight house; outbound freight house; transfer house; industrial district yard; division terminal yard.

There is also an appendix to the report containing much information relative to the dimensions of existing freight-houses, roadways and platforms, grades of streets, size of wagons, etc., obtained by the committee in response to a circular letter sent to members of the Association located in a number of important cities. This appendix is not reprinted here.

Plans Showing Types of Cluster (or General Yard).—Two plans are submitted. They are designed in accordance with the recommendations the committee made in its first report. The clusters (or general yards) are especially designed to eliminate interference in the operation of yards from all causes. In preparing the plans it was found that less interference was caused to switching and road movement and the main tracks less obstructed where the engine-house is located in the center of the yard and the main tracks spread about or run around the yard; both of the types of cluster (general yard) submitted are designed with this end in view. In one of them the yard embraces receiving, separating, classification, storage and departure tracks; in other words, it has the complete series. The yard could be operated either as a poling or summit yard. The length of tracks shown is merely assumed, and could not, of course, be followed in any particular case; to meet most situations the tracks would have to be longer than shown on the plan. Tracks for special purposes, of course, would have to be developed to suit each particular locality, and they are not provided for on either of these designs. In operating a yard as shown, probably one track in the classification and one track in the separating yard would be assigned for cripple cars, and from these tracks the cars would be moved to the regular repair yard. In the second plan the more common practice of having merely receiving, separating or classification and storage tracks is pursued. Departure tracks are not shown; they cannot usually be provided on account of the great length of the yard which they involve.

In submitting these plans for adoption the committee desires it to be understood that they are merely types. The plan for any particular location must be developed to suit the requirements thereof. In either of the plans the "summit" feature can be developed nicely by locating mounds between the receiving, separating and classification yards. Were it necessary to locate the cluster on a grade falling in one direction, it would usually be policy to change the arrangement of the yard; in other words, to locate the receiving yards for cars going in both directions at the upper end of the cluster (or general yard), so that the switching would all be done in the direction of the grade. This would occasion some change in the detail.

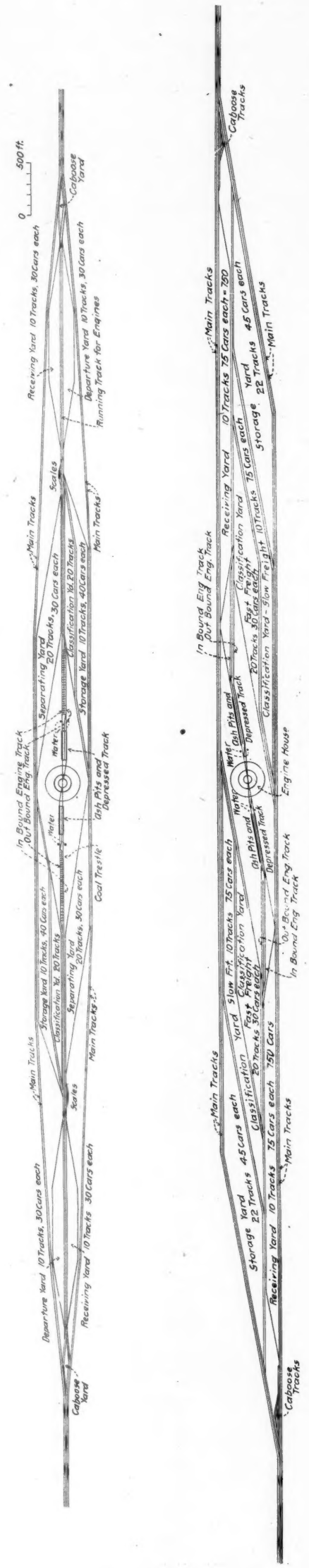

0 500 ft.
Receiving Yard 10 Tracks, 30 Cars each
Caboose Yard
Departure Yard 10 Tracks, 30 Cars each
Running Track for Engines
Main Tracks
Scales
Separating Yard 20 Tracks, 30 Cars each
Classification Yd. 20 Tracks
Storage Yard 10 Tracks, 40 Cars each
Main Tracks
Water
In Bound Engine Track
Out Bound Engine Track
Ash Pits and Depressed Track
Coal Trestle
Caboose Tracks
Main Tracks
Receiving Yard 10 Tracks 75 Cars each = 750
Classification Yard
Fast Freight 20 Tracks 30 Cars each
Storage Yard 22 Tracks 45 Cars each
Slow Frt. 10 Tracks 75 Cars each
Engine House

Fig. 1.—Types of Cluster or General Yards.

Freight-car Repair Yard.—Geographically a repair yard should be located at or near the terminal or point where cars are naturally made empty. The location selected should be such that labor and material can easily be obtained. Locally the yard should be so located that cars to and from the cluster (or general yard) and local yards and unloading points can easily be switched in and out of it without stopping work on more than the one repair track used or interfering with general yard switching. It should also be near enough to these points that switching will not be expensive. Repair yards should be composed, as a general rule, of short tracks, of a capacity of 10 or 15 cars each, so arranged that they will be in pairs; the tracks of each pair should be spaced 16 ft. apart centers, and the pairs should be spaced 40 ft. apart centers.

The material supply yard for this type of repair yard should be located at the end of the repair tracks, so that material can easily be trucked into the openings between the tracks and along these openings to any point in the repair yard. Part of the yard should be provided with air and water-pipes for testing refrigerator and other cars. Air and water connections should be spaced 50 ft. apart. The yard should also be drained.

In calculating the size or capacity of repair tracks, cars should be considered 50 ft. long, so that there will be an open space of 10 or 12 ft. at the end of each car for handling material, trucks, etc. At points where nearly all the work done is light repairs it will sometimes be of advantage, on account of lack of room, to space part of the tracks 16 ft. centers. On account of the small amount of material required in making light repairs, it can easily be moved to any car located on tracks thus spaced.

Long repair tracks are objectionable because of the difficulty in switching out the repaired cars and the delay in waiting for the entire cut of cars to be repaired. The yard should be lighted. If it is not necessary to work at night, the yard should be switched at that time, so as not to interfere with the work. Less switching and delay will be had where light repair cars are kept on tracks separate from the heavy repair cars. Light repairs are sometimes made on the yard tracks, and it will quicken the movement of cars to so arrange that there will be a track for holding cripple cars between the receiving and separating yards of a cluster (general yard). Tinker or very light repair cars should in nearly all cases be repaired on the track on which the cars stand; they should not be moved to the regular repair yards or tracks except in exceptional cases.

The plan shown is only one of many possible types, but it illustrates the principles.

Passenger Coach and Car Cleaning Yard.—Geographically the location should be at the terminal or end of train run, and locally it should be such a location as is easy of approach to and from the terminal station or end of train run. A "Y" track for turning trains is almost always necessary, and the movement to or from it and the yard and station should be free. In large cities the value of land will often prevent the building of a "Y," and in such cases a turn-table capable of handling the largest car seems to be a necessary adjunct.

In order to avoid empty mileage and delay, this yard should be near the terminal station. It is sometimes of advantage to have it connected at both ends, but tracks connected only at one end are usually used. The yard should be composed of tracks spaced about 20 ft. center to center. Some space can be gained by putting them in pairs, with the tracks of each pair 16 ft. centers, and the pairs 36 ft. centers. Where the value of land limits the size of the yard, and thus controls the spacing of tracks, it is felt that tracks can be reduced to 14 ft. centers. This is minimum and should not be used where the greater distance can be had; it will allow the men to pass.

In some cases it will be quite an advantage to have the yard (or at least a few of its tracks) connected at both ends. If the yard is not connected at each end, at the blind end of tracks, and running at right angles thereto, a car cleaners' supply building should be located, with a space between the building and the end of tracks sufficient for the trucking of material to any of the openings between them. The building should be of sufficient size for all supplies, for electrical arrangements, boilers, dynamos, compressed-air plant, steam heat, gas, repair material, dining and sleeping car supplies, oil, waste, etc. If the yard is connected at both ends, this building will have to be at one side, but the yard will usually work to better advantage with it at the end on account of the ease with which material can be trucked to any point in the yard.

The yard itself should be provided with water, steam and air pipes running down between alternate tracks, and, where necessary, with proper arrangements for fur-

*Extracts from the report of the Committee of the American Railway Engineering and Maintenance of Way Association, March, 1902.

nishing gas and electricity. The connections should be spaced 50 ft. apart. The yard should be sewered between each pair of tracks. Some kind of permanent staging should be provided between each set of tracks, from which the cleaning can be done, and which will give the men employed there an opportunity to readily reach the roof of the car as well as the lower parts; a system of poles and brackets, or a trolley arrangement from overhead supports, is suggested. The yard should be well paved or planked, to allow of drainage and of being kept clean and free from dust. A permanent paving is desirable; planking is not, as the use of soap, acids, water, etc., in cleaning will soon cause it to rot. The tracks should be of sufficient length to handle trains without cutting them. In designing the yard, the length of trains to be handled should be considered, so that the tracks may be made of proper length; where more short tracks are required the ladder can be made to run each way (see sketch of "Freight-Car Repair Yard"). The yard should be lighted so that work can be done at night where necessary.

The sketch shown is only one of many possible types of car-cleaning yards. The first, third and fifth pairs of tracks from bottom are 16 ft. centers; all others 20 ft.

Inbound Freight House.—If possible, it is well to locate an inbound freight house so that the empty cars made at the outbound houses or transfer houses can be moved directly to the inbound houses without interference or delay. In some cases, by having adjoining houses, they can be used without being switched. The location should be as convenient as possible to the business district; approach from it should be by streets the grade of which is not great enough to burden the teaming com-

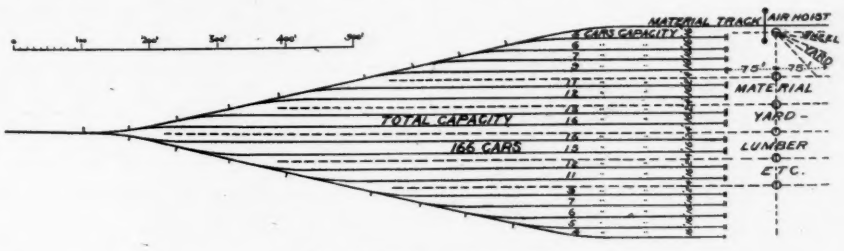


Fig. 2.—Car Repair Yard.

NOTE.—*General dimensions, 1,100 ft. long, 320 ft. wide. Dotted lines show tracks for trucking material. Air and water pipes should be provided between all tracks spaced 24 ft. centers, with plugs every 50 ft. for testing refrigerator and other cars. Yard to be so located that it can be switched quickly and often when necessary. Yard can be placed in any angles of ladder of yard. Yard will frequently have to be built with one ladder, but wedge-shaped yard is of advantage on account of uniformity in length of tracks. Spacing of 16 ft. is for yard for light repairs.*

Fig. 3.—Car Cleaning Yard.

NOTE.—*The broken line denotes water, sewer and air lines. Sewer catch basins to be between each track. Air and water between every other track. Distances between tracks are 20 ft. for each track and 16 ft. and 20 ft. for each alternate track. Only one of these spacings to be used in any yard. When 16 ft. cannot be used for tracks in pairs, 14 ft. is to be minimum distance.*

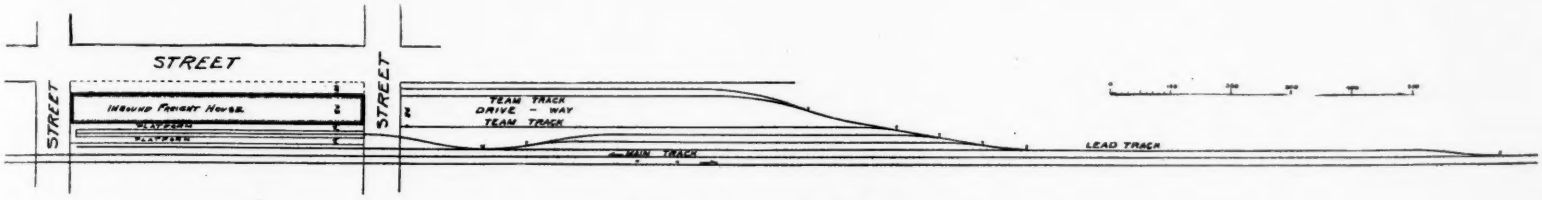


Fig. 4.—Inbound Freight House.

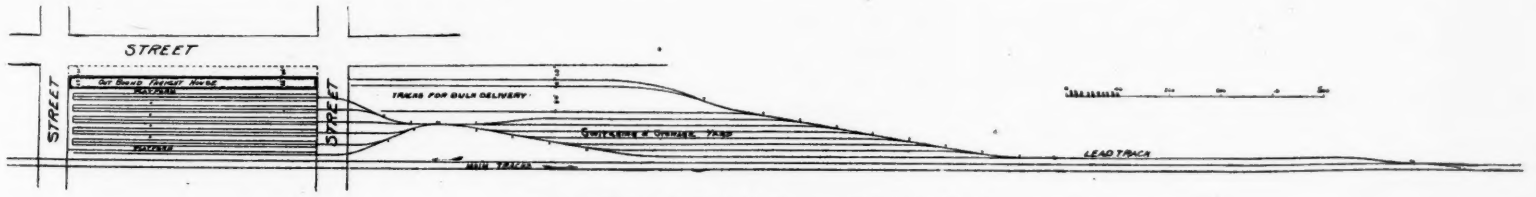


Fig. 5.—Outbound Freight House. (Common Type.)

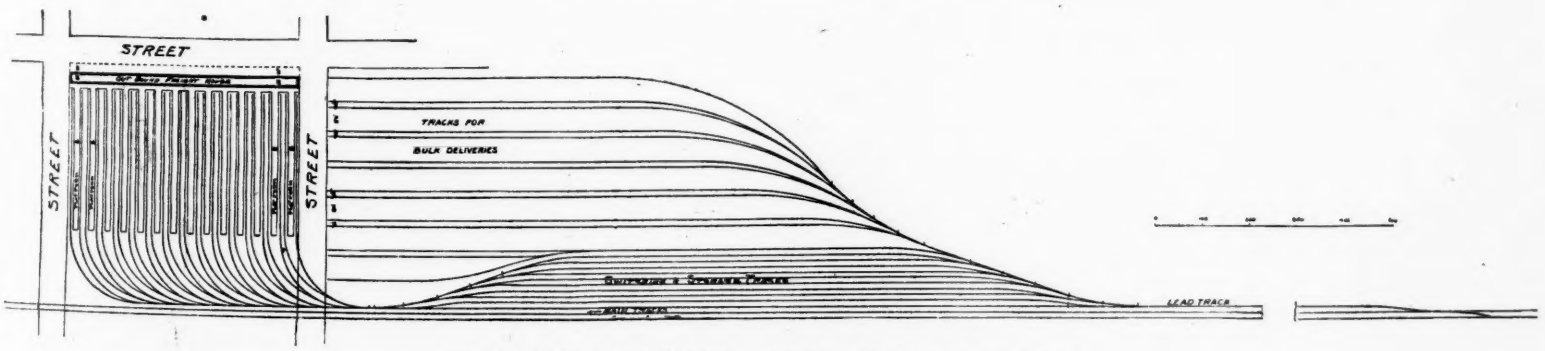


Fig. 6.—Outbound Freight House. (Tracks at Right Angles to House.)

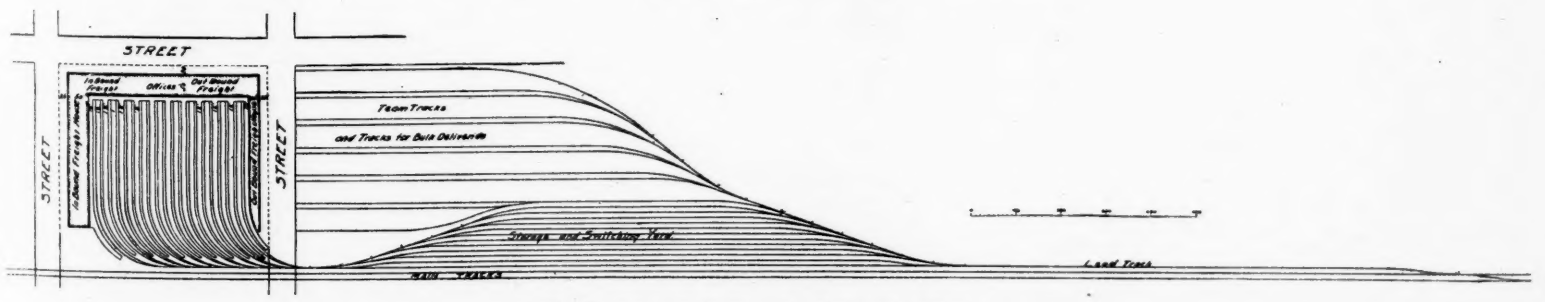


Fig. 7.—Inbound, Outbound and Transfer House.

Fig. 8.—Industrial District Yard.

Fig. 9.—Division Terminal Yard.

munity, say not over four per cent.; this figure, however, will vary in each locality. In Chicago, where there are practically no grades, a four per cent. grade is burdensome; this would not be the case in Pittsburgh, where many of the street grades are as high as seven per cent.

On account of the speed with which the cars in inbound houses can be unloaded it is not often of advantage to have over two tracks at the house; thus it is only necessary to unload through one car. Unloading through cars is always objectionable, as it makes the spotting of cars at the freight house necessary, unless eight or ten-ft. platforms are provided between tracks, and this spotting consumes time in getting the cars in shape for unloading at the house, thus reducing the capacity and increasing the cost. The platforms should be provided wherever space will permit of it. The arrangement of tracks should be such that the cars at the house can be pulled out and new loads set in a minimum amount of time; this is usually provided for by a small auxiliary yard, about as shown on the sketch. It should hold at least as many cars as the freight house tracks accommodate. A cut of empties is pulled back to one of the tracks in the yard and a new cut of loads shoved in. The second cut of empties is pulled out from the house and the second cut of loads shoved in. The empties are then all taken to the cluster (general yard), or to the outbound house, and a new supply of loads set in the smaller yard ready to be switched as soon as those at the house are empty. The track approach to the freight house from the main tracks should be such as not to cause delay. Where the small yard cannot be provided, a lead track should at least be built, to avoid switching on the main tracks.

The proper width of inbound freight houses is 50 ft. The proper length depends upon the amount of business to be done and the allotment of ground for the building. This also sometimes affects the width of the house. The proper minimum width of the roadway where the inbound house is on one side of it and a wall on the other side is 30 ft. The proper minimum width of roadway where the inbound house is on one side of it and a team track or in or outbound freight house is on the other side is 40 ft. The proper additional width, or the distance that the inbound house should be set back from the street where it is parallel to the street, for a space in which teams are to stand when wagon is backed against the freight house, is 20 ft. Between the side of the house and the near track there should be a platform eight or ten ft. wide, to obviate the necessity of spotting cars at doors.

Inbound freight houses will frequently have to store large quantities of freight, and, in order to do this, and not interfere with the prompt movement of business on the first or ground floor, it is frequently necessary to build such houses several stories high, the upper floors to be used for storage. These floors should be spaced 10 ft. apart in the clear, and material should be lifted to them in elevators and endless-chain conveyors. The lower floor is sometimes arranged to slope slightly in the direction of the load, though not much is gained by this.

The business to be accommodated must govern the style of structure, considering volume, kind and character of traffic, the time it must remain on the floor, etc. In large cities, inbound houses usually are separated from outbound and transfer houses, due to lack of room to combine them. It is best, however, where possible to do so, to at least have the in and outbound houses close together, so as to decrease the amount of light wagon mileage to a minimum; where they are together, a wagon will deliver and remove a load with no light mileage. In small towns and cities the houses should usually be combined. It is desirable to provide inbound houses with an overhead crane reaching over two tracks, a platform and a roadway, to admit of the transfer of heavy loads from car to car, platform or wagon. A cold-room should usually be provided for storing butter, eggs and other refrigerator-car freight awaiting delivery. In winter this room can be used for fruit, to prevent freezing. Checkers' offices should be located at proper intervals; they should be properly heated in winter. Electric lights on extension cords for use in cars and houses should be provided; they will soon repay their cost in quickened service. The cords should be of such length as to allow the lights to be moved about, hung on hooks, etc.

Protection against fire should be provided by placing hydrants at intervals throughout the house about 100 ft. apart, each hydrant to be connected with proper length of canvas or other hose arranged on reel or folded in box, or stretched out at length on a shelf so that it can be put into instant service, and arrangements should be made with the city authorities for fire-alarm box and outside hydrants where possible. In a recent fire on the Lehigh Valley the blaze spread so rapidly that the inside protection was not available. Water barrels, buckets and extinguishers should be provided at proper intervals.

It is most important to provide a good, smooth floor; it accelerates the work of trucking and reduces the cost thereof, likewise decreases the amount of loss from rough handling. Hard maple makes a very good, cheap floor, and will wear for years where not exposed to moisture.

Two plans are presented, one showing the ordinary type of inbound house and the other a possible type in which inbound, outbound and transfer houses are consolidated.

Outbound Freight House.—If possible, it is well to locate an outbound freight house so that the empties made at the inbound house can be moved to it without interference or delay. In some cases by adjoining houses they can be used without being switched. This plan cannot often be used, however, as unless cars for certain designated points have fixed locations, truckers are liable to make mistakes and put freight in the wrong cars. The location should be as convenient as possible to the business district. The approach to it should be by streets the grade of which is not great enough to burden the teaming community, say not over four per cent.; this figure, however, will vary in each locality; in Chicago, where there are practically no grades, a four per cent. grade is burdensome, but this would not be the case in Pittsburgh, where many of the street grades are as high as seven per cent.

On account of the delay in getting a full load into cars at outbound houses they must remain at the house a considerable time, usually all day. In large cities the tonnage shipped to many points makes it necessary to have a separate car for each station to which a necessary amount of freight is shipped. There must also be cars for the local or peddler business at small stations along various routes, each such route requiring a car. In this way the total number of cars which must be set at an outbound house is sometimes very large, and, in order to get the proper number, it is frequently necessary to load through four, five, six and sometimes seven cars. It is most important, therefore, in designing such a house to ascertain the proper number of cars which should be placed for loading at the house, and a liberal surplus for the demands of the future should be arranged for. The ordinary outbound house is shown on sketch attached, on which it is arranged to load through four or five cars. If necessary to load through more than four cars, it is advisable to see if the house cannot be enlarged in other ways.

There should be connected with these tracks a small yard for the quick switching of them, so that it will not have to be done on the main track. If possible, the capacity of this yard should be at least as large as the car capacity at the house. This small yard is not as necessary here as it is at the inbound house. The movement from outbound houses is usually made only once a day, except in cases of special shipments, and these latter are loaded into cars at the end of the track nearest the main track, so that they can be switched or moved without interfering with other cars at the house. Between the side of the house and the near track there should be a platform eight or ten ft. wide to prevent spotting cars at doors; also, where room is available, it is of great advantage to construct platforms about eight or ten ft. wide between the tracks, in order to avoid the necessity of spotting cars.

Another type, although not so common, is to have the house abut upon a street and the tracks run up to it at right angles. Between each pair of tracks there should be a covered platform about 12 ft. wide. This house has the advantage of being able to get a large number of cars at the house without the necessity of loading through cars. The average length of the truck haul is usually decreased. Such an arrangement is frequently made where it is desirable to consolidate an in and outbound and a transfer house at one point. On one side is built the inbound house, on the other the outbound house, and between them the office. Cars to be transferred are set on the various intermediate tracks. The advantages of such a house are that the empties made at the inbound and transfer houses are quickly turned over to the outbound house, or can be used for outbound shipments, if necessary, without switching. It gets a large number of cars at the house and enables the local agency to make shipments, on account of the cars being transferred, to many points quickly. It has the advantage of consolidating three features—an inbound, an outbound and a transfer house—under one set of officers and one agent. This tends greatly to reduce the cost and also to quicken the service. The tracks at all these houses should be arranged so as to require the least amount of switching and so that it can be done in the least time. The track movements from the large cluster (or general yard) to the freight house should be such as not to require time or to be blocked; it should be a free movement. Connected with this house should be a small yard, about as shown on sketch, to enable the ready switching of the cars.

The proper width of outbound houses is 25 ft. The proper length depends upon the amount of business to be done and the allotment of ground upon which the building is built. This also sometimes affects the width of the house. The proper minimum width of roadway where an outbound house is on one side of it and a team-track or in or outbound house on the other side is 40 ft. The proper minimum width of the roadway where the outbound house is on one side of it and a wall on the other side is 30 ft. The proper additional width, or the distance that the inbound house should be set back from the street where it is parallel to the street, for a space in which teams are to stand when wagon is backed up against the freight house is 20 ft.

The business to be accommodated must govern the style of structure, taking into consideration volume and character of traffic and the time it will have to remain on the floor, etc. The remarks and recommendations following this statement under "Inbound Freight Houses" are also applicable to outbound freight houses.

Three plans are presented, one showing the ordinary type of outbound house, a narrow house with parallel tracks; a possible type, not so common, with narrow house and tracks running up to the same and at right angles to the house, covered platforms being provided between tracks; also a possible type in which the inbound, outbound and transfer houses are consolidated. These, of course, are merely types, showing possible developments. Many others could be furnished.

Transfer House.—Geographically the location should be at some junction point or points where there is a coming together or bunching up of the traffic and where there is a yard and a natural lay-over point at which the traffic is switched and trains are broken up, or at a point where one railroad terminates and another begins and it is desired to avoid having the cars of one road run on the other road. Locally, where possible to do so, it should be located with the in and outbound freight houses, so that one agent and one set of foremen may have charge of all.

The purpose of a transfer house is the consolidation of less-than-carload lots into carload lots and the breaking up of cars containing shipments to many points and consolidating them into cars containing shipments for only one point or route, or the transfer of freight from car to car to avoid the use of foreign cars. In order to do this it is necessary to be able to set a large number of cars at the house. A transfer house makes cars, or, in other words, by consolidation releases loaded equipment. It is, therefore, of some advantage to have it located at such a point where the equipment thus released can be used.

It is usually made up of a series of tracks in pairs, with covered platforms about 12 ft. wide separating each pair. It should be so located that the supplying of cars for the transfer house to and from the yards can be done without delay. In second-class cities, or at junction points, the transfer house must in most cases be considered in connection with the regular station work and should be designed with this end in view. The same care to provide proper fire protection, good floors, cranes for heavy loads, proper lighting, etc., should be taken as in the case of inbound houses. The accompanying plan shows a type of transfer house consolidated with in and outbound freight houses.

Industrial District Yard.—Large cities are usually divided into what are called industrial or switching districts. In each of these districts one or more engines are required to switch the team-track, freight house, business sidings, etc. If the terminal cluster (general yard) is some distance from these districts, it is customary to run cars into the district from the cluster (general yard) to a small district yard by what is called a transfer engine. These engines leave the cars in the district yard and they, in turn, are then delivered by the district engine to the point where needed. The yard is usually only a number of parallel tracks, on which cars are set. These parallel tracks should be so arranged with a switching lead that they can be switched without interference with the main track, about as shown on the accompanying plan.

Division Terminal Yard.—At many points this type of yard is only needed for trains to pull into, change engines and cabooses, cut off or add a few cars to correct the tonnage for the next division, and pull out, such a movement being called by the English "a bull-pen" movement.

In connection with this yard there should be a small lancing yard in which to put cars for the local trains in station order. (At points where the amount of additional business is great and trains must be broken up into many new parts, the yard takes on the features of a terminal cluster and should usually be so designed.) In this type of yard it is most important to get the movement of engines from house and coal-dock to and from yard so planned that there will be no interference or delay. The yard is usually at a division end and is primarily a holding-place while engines, crews and cabooses are changed. It is at the intermediate end of train runs and any land upon which the yards can be built will answer. It should, however, be so located that the men can get to and from it without much inconvenience, and that cars for the city or town in which the yard is located can be switched to and from the city delivery tracks or freight houses without delay. It should not be located on a limiting grade unless it runs with the traffic. When the necessity for breaking up trains exists, the yard will then assume the features of a cluster (or general yard). The size of the yard depends upon the volume of business and is best measured by the number of trains arriving per hour. The location of the engine house is most important, but must be governed almost entirely by local conditions. It should be studied with much care, so as to locate it where the movement of engines to or from the yards will cause a minimum amount of interference. The plan attached illustrates one of the many simple types of division terminal yard.

In order to get its subjects well in hand the committee has not gone into the minor details of the various matters treated, but has tried to bring out the principles or rules most essential in the consideration of design. This is done in order that it may cover the entire ground in a general way at the earliest possible time, thus giving the Association the greatest amount of information in the least time, the smaller details on each subject to be developed in future reports. It should be remembered that, from its very nature, the committee is almost limited to principles and not details. Illustrating this, it would not be proper for the committee

to outline the construction of a freight or transfer house or the manner of building a track; it is, however, within its province to describe the manner of operating a freight or transfer station or the switching of a yard or terminal. Therefore, in giving these descriptions, many of the details which enter into the maintenance and engineering questions involved in the proper handling of the whole property will be brought to the attention of the Association by the committee in its future reports.

CONCLUSIONS.

The committee begs to submit the following conclusions for adoption by the Association:

Cluster (or General Yard).—In the development of a cluster (or general yard) less interference is caused to switching and road movement, and the main tracks are less obstructed, where the engine-house is located in the center of the yard and the main tracks run around the yard.

Freight-Car Repair Yard.—A repair yard should be composed of short tracks. The spacing of tracks on which light repairs are to be made should be less than that for tracks on which heavy repairs are to be made.

Passenger Coach and Car Cleaning Yard.—The yard should be at such a location as to be of ready and quick access to and from the station. The tracks should be of such length that they will accommodate trains without cutting. Better results will usually be obtained with stub tracks and a car cleaners' repair and supply building located at right angles to them at the stub end of tracks.

Inbound Freight House.—This house should be of such width as will furnish a reasonable amount of floor space for the holding of freight. (Fifty ft. is a good average width.) Usually not over two tracks are needed. These tracks should be provided with platforms to avoid the necessity of spotting cars.

Outbound Freight House.—In order to decrease trucking at this house it should be of narrow width. (Twenty-five ft. is a good average width.) It is of advantage to have a great number of cars at the house so that all freight can be loaded into the cars direct. It is not advisable to load through more than four cars. To prevent the necessity of spotting cars, the tracks should be separated by platforms. Where a great number of cars are required the trucking distance will usually be decreased by having stub tracks running up to the freight house, which is at right angles to them; these tracks to be separated by covered platforms leading to the freight house. In addition to decreasing the trucking distance, this type avoids trucking through cars.

Roadways.—Where the freight house is on one side and a wall on the other side, the proper minimum width of roadway is 30 ft. Where a freight house is on one side of it and a team track or other freight house is on the other side, the proper minimum width of roadway is 40 ft.

Transfer House.—A transfer house should be located at a point where there is a coming together of the traffic and a necessity exists for its consolidation, and where the loaded equipment made empty can be used.

This report is signed by: C. S. Sims, Superintendent, Pennsylvania Lines West, Chairman; W. G. Besler, Gen. Supt., Philadelphia & Reading, Vice-Chairman; E. E. Russell Tratman, *Engineering News;* R. B. Tweedy, Chief Engineer, Wisconsin Central; S. P. Hutchinson, V.-P. and Gen. Man., El Paso & South Western; J. B. Cox, Chief Engineer, Chicago Junction; J. A. Atwood, Chief Engineer, Pittsburgh & Lake Erie; G. F. Morse, Assistant Engineer, Lehigh Valley; A. W. Swanitz, Chief Engineer, Chicago Terminal & Clearing Co.; M. S. Blaiklock, Engineer, Grand Trunk; W. K. McFarlin, Chief Engineer, Delaware, Lackawanna & Western; I. G. Rawn, Gen. Supt., Baltimore & Ohio South Western; J. G. Rodgers, Superintendent, New York, Philadelphia & Norfolk; F. S. Stevens, Superintendent, Philadelphia & Reading, and W. S. Kinnear, Asst. Supt., Michigan Central.

ABSTRACT OF DISCUSSION.

Mr. Tratman: The committee have drawn up, at the request of the Board of Direction, a series of conclusions which represent the gist of the report. The best way will be to read each of these in turn and let them be discussed and passed upon in their order. The first recommendation is:

"Cluster (or general yard).—In the development of a cluster (or general yard) less interference is caused to switching and road movement, and the main tracks are less obstructed, where the engine house is located in the center of the yard and the main tracks run around the yard." (Adopted.)

The second recommendation is:

"Freight-car Repair Yard.—A repair yard should be composed of short tracks. The spacing of tracks on which light repairs are to be made should be less than that for tracks on which heavy repairs are to be made." (Adopted.)

The third recommendation is:

"Passenger Coach and Car Cleaning Yard.—The yards should be at such a location as to be of ready and quick access to and from the station. The tracks should be of such length that they will accommodate trains without cutting. Better results will usually be obtained with stub tracks and the car-cleaners' repair and supply building located at right angles to them at the stub end of tracks. (Adopted.)

The fourth recommendation is:

"Inbound Freight House.—This house should be of such width as will furnish a reasonable amount of floor space for the holding of freight (50 ft. is a good average width). Usually not over two tracks are needed. These tracks should be provided with platforms to avoid the necessity of spotting cars."

Mr. Camp: "Usually not over two tracks are needed." I understand that each track should be provided with a platform. Do they intend that the platform should be built between the first track and the freight house proper, or whether there should be a platform for the freight house? According to that wording, it should be a platform for each track, as there are only two tracks. It is not necessary to have a platform between the first track and the house to avoid spotting cars. The Louisville & Nashville and the Michigan Central roads are building what they call continuous door freight houses. The whole side of the freight house is taken up with a series of doors without any posts, and arranged so that you can open the door at any point.

Mr. Hunter McDonald (M. C. & St. L.): The point is well taken. I do not think the platform should be next to the freight house; there should be two tracks next to the freight house, and the transfer platform beyond. I have seen in operation during the past year and a half two large freight houses built by the Louisville & Nashville at Nashville, where the bottom chord of the roof truss is extended eight feet beyond the posts; any part of the entire side of the building can be opened up and there is no obstruction; no cars have to be spotted on the first track.

Mr. J. H. Abbott (B. & O.): The wording of the conclusion seems me happy, in that it does not specify that you must have a platform or not a platform; the only point in view is that it shall avoid the spotting of cars. (The fourth recommendation adopted.)

The fifth recommendation is:

"Outbound Freight House.—In order to decrease trucking at this house it should be of narrow width (25 ft. is a good average width). It is of advantage to have a great number of cars at the house so that all freight can be loaded into the cars direct. It is not advisable to load through more than four cars. To prevent the necessity of spotting cars, the tracks should be separated by platforms. Where a great number of cars are required the trucking distance will usually be decreased by having stub tracks running up to the freight house, which is at right angles to them; these tracks to be separated by covered platforms leading to the freight house. In addition to decreasing the trucking distance, this type avoids trucking through cars."

Mr. Abbott: I will offer an amendment that instead of the words, "The tracks should be separated by platforms," that the same wording as used in the previous paragraph be adopted, viz., "These tracks should be provided with platforms to avoid the necessity of spotting cars." I do not altogether like the idea of requiring that platforms should be placed between each separate track. It may be desirable to have pairs of tracks without platforms, outside of the door, and without having each side provided with a platform over the side tracks.

President Kittredge: The committee will accept the amendment in the phraseology.

Mr. W. C. Cushing (Penn. Lines West): I take exception to the statement that 25 ft. is a good average width for outbound freight houses. I think it is a minimum width. I think the proper width for outbound freight houses is 30 ft., and I make a motion to change it to 30 ft. insead of 25 ft. (Not seconded.)

Prof. W. D. Taylor (U. of W.): I move that the parenthetical clause be made to read, "25 or 30 ft."

Mr. Lum: In seconding that motion, it seems to me that it ought to be determined what is the platform, and what is the house before the width is fixed or voted on. Mr. McDonald refers to a house which is all platform or all house, as you may consider. Of course, the side of the building next to the street is not a platform. The platform of the building then extends from the street to the car, or within a clearing distance of the car. The posts that have been referred to stand back 8 ft., we will say 9 ft., from the car itself. The roof extends beyond that post to a line with the platform. At the line of the platform, the floor or wall of the building is situated. Therefore, you have either no platform, or it is all platform, as you consider it.

Mr. McDonald: I understand this clause and the previous one to mean that if I choose to cover my platform over and make it all house, I can have it all house; and if the platform should be 8 ft. wide, I will have a house 33 ft. wide, and with that understanding in the matter, I see no necessity for any change in the clause at all.

President Kittredge: It occurs to me in taking the average practice of houses that 25 ft. is probably too wide rather than not wide enough. If you take all the freight houses in the country you will find a great many more small houses than large ones. If the matter is measured by the prevailing width of houses at present, I think 25 ft. is too wide. If you should measure it by the amount of business done over a platform, probably there would be more business done over one platform in Chicago than there would be over 500 platforms in a town the size of Hazelridge.

(Amendment not adopted.)

The sixth recommendation clause is:

"Roadways.—Where the freight house is on one side and a wall on the other side, the proper minimum width of roadway is 30 ft. Where a freight house is on one side of it and a team track or other freight house is on the other side, the proper minimum width of roadway is 40 ft." (Adopted.)

The seventh recommendation is:

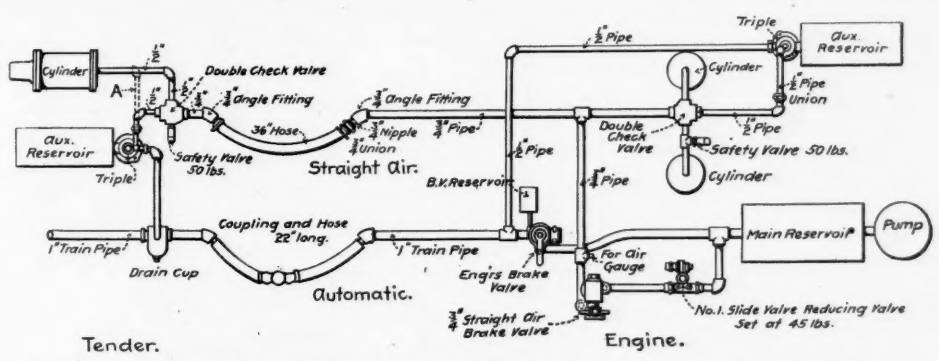
"Transfer House.—A transfer house should be located at a point where there is a coming together of the traffic and a necessity exists for its consolidation, and where the loaded equipment made empty can be used." (Adopted.)

The Combined Straight Air and Automatic Engine and Tender Brake.

A paper having this title was presented by Mr. F. B. Farmer at the March meeting of the North-West Railway Club and the accompanying illustration and extracts are from advance sheets of the paper. The discussion is not yet available.

Referring to the Westinghouse Air Brake Co.'s combined straight air and automatic brake, as illustrated in their catalogue of 1882, it is explained that the main features of the present arrangement are the same in general but that the equipment has been simplified and improved. The illustration shows the latest arrangement. Mr. Farmer speaks of the differences as follows:

"In the first place, the present apparatus differs from the old in being used alone for the driver and tender brakes, thus avoiding the serious objection of a second line of pipe and hose. But the reason for its introduction in this changed form is the constant and heavy pressure brought to bear to facilitate the movement of freight and lessen the damage done to equipment and lading. Originally it was designed as an adjunct to the usual switch engine brake apparatus, but experience has demonstrated that it is valuable on freight engines. Those who have been closely in touch with switch engine service know that, as a rule, engineers who have had experience with steam or vacuum brakes on such engines very much prefer them to the automatic brake in spite of the annoyance of the steam leakage, freezing in winter and the trouble with vacuum brakes incident to leaky diaphragms. The reason is their greater flexibility of operation."



General Arrangement of the Combined Straight Air and Automatic Engine and Tender Brake.

The details of the equipment are illustrated in the paper, and the various advantages of straight air and disadvantages of automatic brakes for switching are considered along familiar lines. Instructions for operating the combined apparatus and an argument for its use on road engines will probably be of most interest to our readers, and these are here given in full:

Instructions for Operating.

The following simple instructions must be followed in operating the brakes:

Always carry an excess pressure of 10 pounds or more with the automatic brake valve.

When using automatic, keep the straight air-brake valve in release position. When using straight air keep the automatic brake valve in running position so as to maintain the excess pressure and keep the triple valves in release.

Do not apply automatic when straight air is on, but first release the latter, an almost instantaneous operation.

Though straight air can be applied while the automatic is on and without getting an excessive cylinder pressure, yet neither brake valve will afterwards release the engine and tender brakes until the other is also in position to release brakes.

Straight Air for Road Engines.

The many devices designed and used for the purpose of either giving an independently operated driver brake, or, if not permitting an independent application, to at least enable it to be held on, plainly indicate a marked need for something of this nature. Probably the most commonly used device is the retaining valve applied to the driver brake. The main purpose for this use of the retaining valve appears to be to keep the slack from running out suddenly, and thus avoid a break-in-two when the brakes on a long train are released at low speed.

The writer is not alone in believing that a retaining valve for this purpose causes more trouble than it prevents. In the first place, the device at the most can merely cause a slow fall in driver brake cylinder pressure down to 15 lbs. and retain this amount. There seems little or no doubt that even under fair maintenance of the engine brake there will at times be conditions of the track and train where the driver brake retaining valve cannot prevent the serious shock. But this is the least evil, for on account of long piston travel, cylinder leakage or leakage between the triple and the retaining valve, the cylinder pressure will either be too low at release

or fall too rapidly and too far; then damage to the train follows.

One road doing a large business and handling long trains has applied the straight air to about 25 road engines and the results in an experience of over a year are highly satisfactory. True, it can be abused and cause shocks which, while less severe, are similar to those following a harsh application of the automatic brakes where a few cars are used to brake a long train. Yet such a result is not so liable to occur and is less excusable with the straight air than with the automatic, operating, as it does, on both driver and tender brakes, and being unaffected in holding power by either piston travel or leakage, unless the pistons strike the cylinder heads or the leakage is excessive; also as cylinder pressure is in no way dependent on what was got by the automatic application, it follows that it will absolutely insure against the slack running out when releasing under any conditions when moving ahead. Nor is this its only use. When the train is to be slowed down for a bad piece of track, or to pick up the brakeman who closes the switch after the train has pulled out of a side track, the straight air does the work and reduces the pump labor and liability of train brakes sticking.

When switching is to be done it is as handy as on a switch engine. It is surprising what a load it can hold on a steep grade, once the slack is bunched and the train standing. This enables the train to be held and the auxiliary reservoirs kept charged ready for immediate service when the start is made. As it cannot leak off, leakage being automatically supplied when the handle of the straight air-brake valve is in application position, it is valuable as a safeguard when cleaning fires, oiling the engine, or when the engine is left for a time. Where sags or humps tend to run slack in or out suddenly, the straight air can be used to render such so gradual as to be harmless.

It does wear out more brake shoes, but this keeps the tires in better shape, thus becoming an advantage in this respect. Also, it requires more frequent adjustment of driver and tender brake piston travel, a natural result of the increased use and shoe wear. As the two driver brake and one tender cylinders are connected when using straight air, it follows that the pressure must be equal in all, thus uniformly distributing the work where leverage is correct and pistons do not strike on cylinder heads.

In conclusion, it can be said that the device has passed beyond the experimental stage, on a switch engine, having proven to be a time saver, and reducing the shocks incident to switching when compared with the automatic brake. These and other advantages have been proven for road engines in special service, yet the character of such work is so similar to that in general work as to encourage a strong belief that it will prove equally satisfactory and valuable on any freight engine, but particularly on heavy ones or those doing local work.

Report on the Fire in the Liverpool Tunnel.

The report by Colonel Yorke and Mr. A. P. Trotter on the fire which occurred last December in the Dingle tunnel of the Liverpool Overhead Railway, causing the death of six persons, has been issued.

The conclusion is that the fire was due to a defect in one of the motors, and would have been productive of no serious danger if the driver had acted with prudence. Colonel Yorke says that the circumstances of the case directs attention to the advisability of removing all woodwork as far as possible from the neighborhood of the electrical machinery upon railroad carriages and of adopting for the purposes of insulation some material which is non-inflammable and smokeless. He advises engineers to act on certain valuable suggestions made by Mr. Trotter, whose report we abstract below. Stations situated in tunnels on electric railroads should have as little woodwork about them as possible. The platforms should be stone or concrete, and buildings such as signal boxes of brick or iron. The Liverpool Overhead Railway Company has adopted this principle in reconstructing Dingle station, there being now practically no woodwork at all about the place.

Mr. Trotter goes into detail as to the cause of the accident. He says:

The evidence goes to show that the insulated covering of a cable connected with the motor on the after part of the train had become deteriorated. The wet weather may have contributed to the defect, and, as the train was late, the driver may have forced the speed. The insulation broke down, an electric arc was started, the rush of current opened the automatic circuit-breaker, and stopped the train. The driver reset the circuit-breakers and tried to start several times, and the arc broke out each time, causing the flashes. It is not unlikely that the driver held up the circuit-breaker, for the lights went low, showing that a very heavy current was being taken. The arc, due to this heavy current, or, perhaps, the earlier flashes, set fire to the woodwork of the coach, and the strong wind caused the fire gradually to spread.

The opening of a circuit-breaker is a common occurrence; the driver should have disconnected the rear motor, and should have run in with one motor. In cases of breakdown of one motor, the journey is often thus completed. Motors and the connecting cables on electric railroads and tramways often break down through the failure of the insulation. The possibility of a panic from smoke arising from such failure on tunnel railroads has been foreseen, and must be guarded against, but eight years' experience on this railroad has shown that such failures, even when resulting in a burnout of a motor, have never before set fire to any part of the train.

This railroad is one of the pioneer lines. The motors are identical in pattern with those first fitted in 1893, but the parts have been gradually replaced as they wore out. The motors are overhauled about once for every 30,000 miles run. The armature of the motor, to which the accident is attributed, was re-wound in February, 1896. Since then it has been overhauled, and repaired if necessary, 11 times, and since February, 1896, has run 153,571 miles. The magnets were re-wound in September, 1899, and were specially overhauled in December last. A train had been fitted experimentally with modern ironclad motors, adapted for higher speeds than at present, but the absence of iron casings in the present instance is not an essential matter.

Recommendations.—Flexible cables covered with india rubber or other combustible material are used unnecessarily in many cases in electrical work. They are used from habit and for convenience. This mode of construction does not commend itself to mechanical engineers. Combustible insulating materials should not be used on the main current conductors of electric trains, particularly in tunnel railroads. These conductors should be rigid, and might be bare, or enameled, or protected by incombustible ferrules in iron pipes. Flexibility should be restricted to necessary joints, and not used for convenience in arranging the conductors. Flexibility should be provided by pinned hinge or knuckle joints shunted by bare flexible links of wire gauze, or cable braided with wire, or by some other sound mechanical mode of construction. Little or no woodwork should be used in the construction of electric locomotives, or of the driver's cabs of motor coaches, and in the latter, the resistances and the controlled switches should be placed, if possible, in front of and outside the cab.

Convertible Ballast and Gondola Car—Atchison, Topeka & Santa Fe.

On September 20, last, we described a convertible ballast and gondola car, built by the Rodger Ballast Car Co., Chicago. At that time one equipment of these cars had been in service about six months, and had been put to a severe service test in order to show if there were weaknesses, or faults in the design. This style of car was then put on the market and now some eighteen hundred have been contracted for and are now being delivered to various roads in different parts of the country. The illustrations show the car as built for the Atchison, Topeka & Santa Fe, six hundred of which cars are now being delivered to that road.

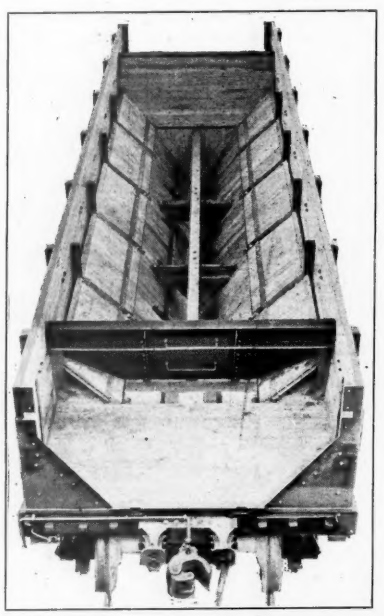


Fig. 1.—Top View of Car Arranged for Ballasting.

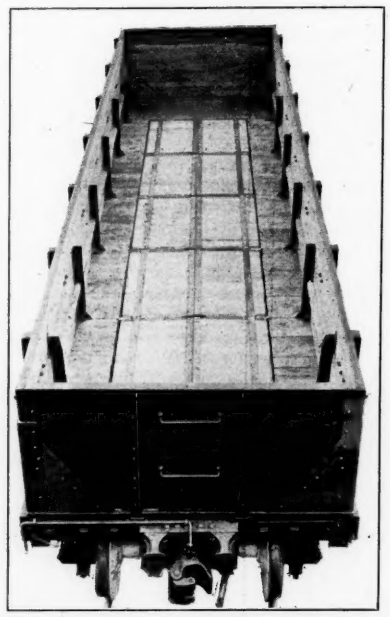


Fig. 2.—Top View Arranged as a Gondola.

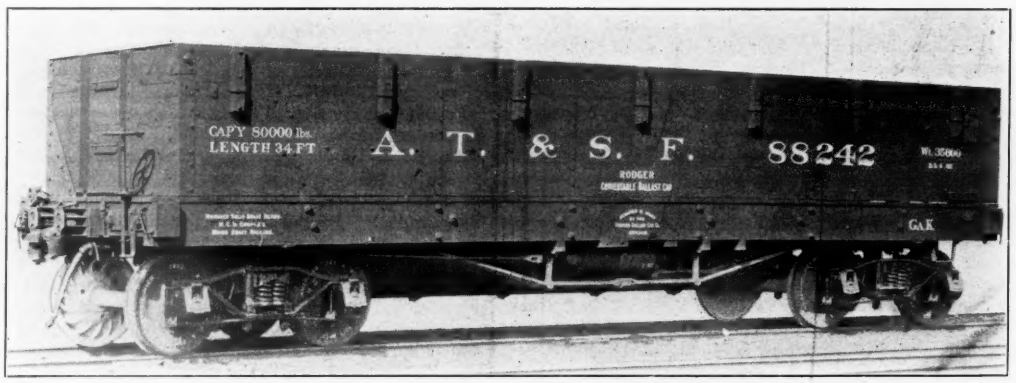


Fig. 3.—Convertible Rodger Ballast and Gondola Car.

Objection has been raised quite often to a car having any convertible features, it being held that this is an element of weakness. However, upon an examination of the construction of this convertible car this objection has been waived. It is acknowledged thoroughly practical for the purpose for which it is intended, and it is generally considered an improvement over the old style Rodger car.

Fig. 1 is a top view of the Santa Fe car, arranged as a standard Rodger ballast car. This shows a center sill, which is made removable, in case the material to be dumped from the hopper is of a sticky consistency and shows any tendency to clog and interfere with the ready dumping of the car. In case the material is free gravel or broken stone, it is not necessary to remove this center sill, and free running material will run past this sill on either side, dumping readily. In case the ballast contains a certain amount of clay or loam, so that it does not run freely, this sill can be removed and placed under the upper part of the hopper, between the sloping sides and the angle iron stakes, thus giving a hopper entirely free for its whole length which will dump any material suitable for ballast.

Fig. 2 is a top view of the same car, converted into a flat bottom gondola car. This also shows the use of the inside steel stakes, which allow the placing of the side boards flush with the outside of the side sills, thus gaining for a given width the greatest loading capacity. Fig. 3 shows a side view of the car, converted into a gondola, and illustrates plainly the strong end construction used.

The method of converting the car has been simplified so that it is only necessary to remove the tie rod just under the sloping end of the car, shown clearly in Fig. 1, after which the sloping end can be raised and placed in a vertical position; then the foldable sections are laid flat, resting upon the center sill, forming a gondola car. It will be seen that this involves the loosening of two nuts. The conversion requires no mechanism and is done entirely by manual labor. While it requires three or four men to do this work it avoids mechanism or complicated appliances.

There will be a large number of these cars built between now and July, at the works of the American Car & Foundry Co. at Detroit, Mich.; Berwick, Pa., and Chicago. It will be seen that almost any type of truck can be used and the cars can be built in accordance with the standard specifications of individual roads.

Signs, Fences, Crossings, Etc.*

It was decided to limit the report to surface crossings and crossing gates. The most common means employed for protecting crossings are gates, operated by watchmen; alarm bells, operated mechanically, and watchmen or flagmen. Of these, gates are the most effective; flagmen (without gates) next, and automatic alarm bells the least so.

From information received from twenty-eight roads, operating 62,297 miles, it would appear that the best service is got from pneumatically-operated crossing gates. These give but little trouble from various climatic conditions, are simple, cheaply maintained, and several sets can be operated by one man from a tower, if so located as to give a proper view.

The cost of one set of such gates, as given in the report of 1901, is about $475, to which $100 should be added if a tower is used. The cost of operation is about $480 a year, based on 10 hours a day, and the cost of repairs is about $60 a year. At streets where electric railroad lines cross the steam-road tracks at grade, derails can be placed in the electric line tracks, and be operated pneumatically along with the gates, adding materially to the safety of such crossings.

Of the next method of protection (flagmen), but little can be said that is not well known, the degree of safety depending wholly on the reliability of the men employed. The yearly cost of protecting a crossing in this manner

*Extracts from the Report of the Committee of the American Railway Engineering and Maintenance-of Way Association. March, 1902.

is estimated at $500, this including flags, lanterns and other supplies which have to be furnished the flagmen. The cost of a watch-box varies, but can be averaged at $50 for each crossing.

Of alarm bells, those operated by electricity and actuated by a track circuit are recommended. The gong should not be less than 12 in. in diameter, and the track circuit distance should be such as to allow the bell to ring at least 45 sec. before a train reaches the crossing; with a train speed of 60 miles an hour, this would require 4,000 ft., a greater distance than is considered advisable with any of the bells at present on the market. A light showing red each way on the crossing, while the bell is ringing for an approaching train, is a useful adjunct. The cost of an electric alarm bell installed, where there are not numerous switches, is $275, and the cost of maintenance about $25 a year.

Warning signs should be placed at all grade crossings of public roads, both in cities and towns, and where the use of the whistle is allowed, proper signal posts also, placed not less than 1,000 ft. each way from the crossing; but where the use of the whistle is prohibited, and the crossing has no other protection, signal posts for ringing the engine bell should be set up.

The greater proportion of grade crossings in the country require no protection other than that given by the usual warning signs at the crossing and the whistle posts, placed each side of the same. At such crossings as have to be fenced, cattle-guards should be provided of good construction, and with secure wing-fences, the distance between these to be governed by the width of the crossing. Where the travel over a country highway is of such volume as to warrant some additional protection other than that given by the engine whistle and bell, it is recommended that an automatic alarm bell be used, this being deemed sufficient for such points.

The report also describes in detail different constructions of grade crossings to suit the following conditions: Crossings where paving is required to conform to street specifications; streets where no paving is required; public roads outside of towns or cities and crossings of private or farm roads.

This report is signed by R. Southgate, Eng. M. of Way, Southern Railway, Chairman; H. C. Ferris, Asst. Ch. Eng., Hocking Valley, Vice-Chairman; G. F. Bidwell, Gen. Man., F. D. & M. V. Railroad; J. R. W. Davis, Eng. M. of Way, Erie Railroad; C. H. Ewing, Ch. Eng., Central New England Railroad; F. C. Miller, Eng. M. of Way, Chicago & Alton Railway; F. H. Alfred, Asst. Engineer, Pere Marquette Railroad; F. C. Stimson, Roadmaster, C. & N. W. Railway, and E. G. Ericson, Assistant Engineer, Pennsylvania Lines West.

Locomotive Sparks—Theoretical Considerations.*

V.

[The article under this head, March 14, gave results applicable to a body, falling freely, as in a vacuum, and partaking at once of the velocity of the wind, when liberated. These conditions were, of course, assumed and are not those which actually exist. The following paragraphs deal with such modifications in the general process as must result when an actual spark is substituted for a freely falling body.—EDITOR.]

Values given in Tables IX. and X. [see the article March 14] do not accurately represent the horizontal distances which a spark may be assumed to travel after leaving the stack, owing to the fact that these values were computed by using 32.2 as the acceleration due to gravity. This value represents the velocity of a body starting from rest and falling in vacuum for one second. A spark is a comparatively light body, and the resistance of the atmosphere impedes its movements; hence, after its emission from a locomotive stack, it will remain in the air for a longer time than a heavier or more dense body. In other words, the apparent value of the acceleration of gravity for a spark is less than 32.2 ft. per second. Before tables can be constructed, similar in form to those representing the movement of a freely falling body (Tables IX. and X.), it is first necessary to determine the acceleration for a falling spark in air. Such a determination has been made experimentally. To serve in this research special apparatus was designed, the essential details of which are shown in Fig. 62. It consists of three vertical rods, the two outer ones being placed before a graduated scale showing feet and inches. Upon each of these two outer rods slides a horizontal arm, at the outer end of which is fastened a cylindrical tube, open at both ends. Two movable horizontal arms extend from the central rod. At the extremities of each of these arms is fastened a flat piece of metal for covering the bottom of the tubes. In conducting the experiments the tube *A*, Fig. 62, was first placed at some predetermined height h_1, and the movable bottom *C* adjusted to the lower end of the tube. The tube *B* was then placed at some height less than h_1, and its bottom piece likewise adjusted. In the upper tube, *A*, was next placed a small lead bullet. In the lower tube, *B*, was placed a spark taken from the front-end of a locomotive. A quick rotation of the central rod served to withdraw the bottoms from both tubes simultaneously and to allow their contents, in one case a bullet, and in the other case a spark or cinder, to fall to the floor. By repeated trials the tube *B* was finally placed at a height such that the spark and bullet both reached the floor at the same instant. By noting the heights h_1 and h_2 from which the two bodies dropped, respectively, and from a knowledge of the acceleration of gravity for the bullet (assumed to be 32.2), the acceleration for the falling spark was determined.

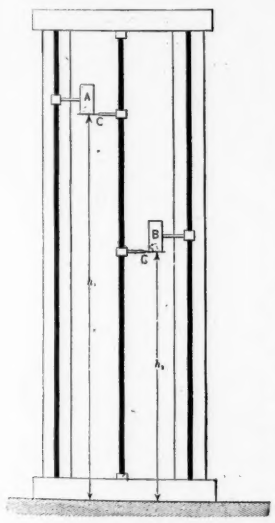


Fig. 62.

A long series of experiments was thus conducted, and from the results obtained the average value of the acceleration for a falling spark was found to be 22.72. The sparks experimented with were both cold and incandescent, but differences due to changes in the temperature of the spark were too small to be detected.

Tables XI and XII have been computed under conditions identical with Tables IX and X, respectively, except that the value of a (22.72) was used instead of g (32.2). It is to be noted that the values of d given in Tables XI and XII are uniformly greater than those given in Tables IX and X, respectively, a fact entirely consistent with the conditions imposed.

Table XI.—The Horizontal Displacement of a Spark Under the Influence of Wind.

Velocity of wind. Feet per second.	Miles per hour.	Initial height of spark in feet. 15	20	25	30	40	50	75	100
2.93	2	3.3	3.8	4.2	4.6	5.4	6.0	7.4	8.5
7.34	5	8.2	9.5	10.6	11.6	13.4	15.1	18.4	21.3
11.74	8	13.1	15.2	16.9	18.6	21.4	24.2	29.5	34.0
17.60	12	19.7	22.7	25.4	27.9	32.2	36.3	44.2	51.0
23.47	16	26.2	30.3	33.9	37.1	42.9	48.3	58.9	68.0
29.34	20	32.8	37.9	42.3	46.4	53.6	60.4	73.7	85.0
44.01	30	49.2	56.8	63.5	69.6	80.4	90.6	110.5	127.5
58.68	40	65.6	75.8	84.7	92.9	107.2	120.9	147.4	170.0
73.35	50	81.9	94.7	105.8	116.1	134.0	151.1	184.2	212.5
88.02	60	98.3	113.7	127.7	139.3	160.8	181.3	221.0	255.0

Table XII.—The Horizontal Displacement of a Spark Projected Vertically Upward from an Initial Height of Fifteen Feet and Free to Move Both in Response to Gravity and to the Influence of Wind Acting in a Horizontal Direction.

Velocity of wind. Feet per second.	Miles per hour.	Maximum height in feet to which the spark is projected. 15	20	25	30	40	50	75	100
2.93	2	3.3	5.7	6.9	7.8	9.6	11.1	13.9	16.4
7.34	5	8.2	14.3	17.3	19.8	24.0	27.8	34.9	40.9
11.74	8	13.1	22.8	27.6	31.8	38.5	44.5	55.8	65.5
17.60	12	19.7	34.2	41.5	47.6	57.7	66.8	83.7	98.2
23.47	16	26.2	45.6	55.3	63.5	76.9	89.1	111.7	130.9
29.34	20	32.8	57.0	69.1	79.4	96.1	111.3	139.6	163.7
44.01	30	49.2	85.5	103.7	119.2	144.2	167.0	209.4	245.5
58.68	40	65.5	114.0	138.2	158.8	192.3	222.7	279.1	327.4
73.35	50	81.9	142.5	172.8	198.5	240.4	278.3	348.9	409.2
88.02	60	98.3	171.1	207.3	238.1	288.4	334.0	418.7	491.0

It is obvious that a spark projected from a moving locomotive will, other things being equal, travel a maximum distance from the track when the direction of the wind is at right angles to the direction of the track. The values given in the preceding tables may be taken to represent maximum distances from the track at which sparks will alight when the direction of the wind is at right angles to the track. For all other directions of wind relative to track, the distances from the track at which sparks will find lodgment will be less than those given in the tables. . . . Table XIII gives multipliers by the use of which the values in Tables IX to XII, inclusive, can be made to show the distance from the center of the track, at which a spark will alight under the influence of winds which blow at various angles with the direction of the train's motion.

Table XIII.

Angle which direction of wind makes with direction of the train's motion.	Multipliers to be used.
30	.500
45	.707
60	.866

For example, from Table XI it will be found that when the initial height is 20 ft. and the wind velocity is 12 miles per hour, the maximum distance traversed by the spark will be 22.7 ft. This distance assumes the wind to blow at right angles with the track. If the wind is assumed to blow at an angle of 45 deg. with the track, this value of d would become $.707 \times 22.734 = 16.0$. . . .

The train's motion does not affect the maximum distance from the center of the track at which the spark will alight except in so far as incidental air-currents may have their influence.

*Abstracted from advance sheets of a book now in press entitled "Locomotive Sparks," by W. F. M. Goss. To be issued by John Wiley & Sons, 43 East Nineteenth street, New York. See the *Railroad Gazette*, Feb. 28, March 7, 14 and 21.

The King's Journey to the West.

Through the courtesy of Mr. T. I. Allen, the Superintendent of the line (Great Western), I am enabled to give the following particulars of the runs: In both directions it was notable for the length without a stop; down it was 228 miles 39 chains, and up, from Plymouth to London, it was 246½ miles. The train was composed of five coaches, all on bogies, and weighed, empty, 127 tons 6 cwt. The engine was one of the standard passenger and was renamed "Britannia" for the occasion, her previous name being "Baden-Powell."

The start was made at 10:31 from Paddington, the first 36¼ miles to Reading taking only 38½ minutes; Bath was passed in 111 minutes for the 106¾ miles, and the junction at Bristol was passed in 122 min. for the 116¾ miles. The usual slow for the loop line was made and then the length on to Exeter was run in 85 minutes, with the slow at Taunton to 30 m.p.h. The whole distance from London to Newton Abbot had taken 3 hours 55 min. for the 213¾ miles, with four slows to 15 m.p.h. As the line on is single, the speed was reduced and the train finally pulled up in Kingswear station, 228 miles 39 chains, in 4 hours 2 minutes, or 1½ minutes ahead of time.

The up journey was made from Plymouth and the start was booked at 11:40 from the Millbay Junction. The same engine and train were used. Newton was passed in 47 minutes for the 33 miles of heavy hills, 1 minute before time. Exeter was reached at 12:56 and there was a slow there to 20 m.p.h.; the next 31 miles to Taunton occupied 34½ minutes, in spite of the long climb out of Exeter. All along the pace was very steady indeed and the train ran into the station at Paddington to the minute, 4:25 p. m., or the 246 miles in 4 hours 45 minutes, with all included. Incidentally this run served to show the completeness of the signal plant of the Great Western, as the last 45 minutes of the return journey was made through a dense fog.

This is probably a record; the King likes good speed and long runs. It is a great feather in the cap of the Great Western that there should have been such punctuality as well as lack of incident on the runs. My thanks are due to Mr. Allen, as I have not seen elsewhere the times, which he kindly took himself.

LONDON, March 18. R. HOPE.

The Northern Securities Suit.

Last week some interesting testimony was taken in New York in the matter of the Power suit against the Northern Securities Company. The testimony of Mr. Morgan, which was the most interesting and important, did not appear until Wednesday afternoon, too late for our issue of last week. Some extracts from the testimony, very much condensed, appear below.

MR. MORGAN'S TESTIMONY.

Mr. Morgan said that he had absolute charge of the reorganization of the Northern Pacific Railroad in 1896.

"Was not this a pretty large transaction, involving $26,000,000?" asked Mr. Lamb.

"No, it did not seem so to me. Twenty-six million dollars did not change hands. The Northern Pacific stock at that time was very cheap and to the best of my recollection the actual amount of money that passed was between two and three millions of dollars."

Mr. Morgan said that he had taken a great personal interest in the policy and general management of the Northern Pacific. He had not paid any particular attention to details, however. No large transactions would be likely to be undertaken by the Northern Pacific directors without consultation with him, yet the board had the authority to do whatever it saw fit without regard to him. The policy of the Northern Pacific was to operate an independent railroad entirely free from any partnerships. So far as the witness knew there were no alliances with other roads regarding traffic and rates.

"Has any other road any voice in Northern Pacific management?"

"Since the reorganization in 1896 the stock of the Northern Pacific has not been controlled by any other road. The Northern Pacific has been run absolutely without reference to any other road, and it has been very prosperous. To a certain extent the Great Northern is a competitor of the Northern Pacific."

"Has there been sharp competition between these two roads?"

"Well, I should say so. I cannot imagine any sharper competition than exists between these two roads to-day."

About dissolution of the Northern Pacific voting trust, Mr. Morgan said that this step was decided upon in October, 1900. He came to the conclusion that the condition of the road was such that it should be turned over to the stockholders and he also believed that the time was near when the preferred stock should be retired as was provided in the reorganization plan. The directors had been chosen by the voting trust for four years and he wanted the stockholders to elect the board whose duty it would be to retire the preferred stock.

The Northern Pacific Railroad Company was put to no expense whatever by the retirement of the $75,000,000 of preferred stock and the issue of bonds convertible into new stock.

Mr. Morgan told the story of the purchase of the Chicago, Burlington & Quincy Railroad as follows:

"Two years or more ago I made up my mind that it was essential to the interests of the Northern Pacific road to secure an eastern terminus in Chicago. It was about the same time that the New York Central, of which I am a director, extended its system to Chicago by purchasing the Lake Shore road. It was deemed advisable that the transcontinental and other roads should meet in Chicago. I talked this matter over with several railroad men and they agreed with me. There were three lines that seemed to be available. These were the St. Paul, the Burlington and the Wisconsin Central. I did not want the latter under any circumstances and concluded that it would be well to buy the St. Paul. I talked the matter over with James J. Hill and suggested to him that the Great Northern share the expense of the proposed purchase with the Northern Pacific. He agreed to this and expressed a preference for the Burlington. He acquiesced in my views, however, and left it to me to negotiate for the St. Paul. The directors of the last-named company took the matter up and finally voted not to sell the property at any price. Then Mr. Hill undertook to buy the Burlington. He got the controlling owners of that property to agree to take $200 a share for their stock, and

I told him to buy it at that price. The next day I went to Europe, and I do not know how the details were worked out. The transaction was completed."

"Did your firm buy any St. Paul stock while negotiations for the control of that road were pending?" asked Mr. Lamb.

"No, sir," replied Mr. Morgan, with emphasis. "And I want to say once for all that when J. P. Morgan & Co. is acting in a fiduciary capacity it is not speculating in the open market."

"Why did you pay $200 a share for the Burlington stock when it was selling at a lower figure in the open market?"

"Because we could not get the control at any lower figure. Mr. Hill made the best bargain that he could, and he is not in the habit of making bargains that are unprofitable."

Mr. Morgan said that he was not aware that the Northern Pacific and the Great Northern had been for some years competing for the Burlington traffic. But he added that he never knew of two railroads in the same or contiguous territory that did not compete. That was the natural order of things. The Northern Pacific might have bought the Burlington without the co-operation of the Great Northern, but Mr. Morgan did not think that the Northern Pacific stockholders would have liked to shoulder so heavy a burden.

"Don't you know," asked Mr. Lamb, "that there is a provision in the trust indenture covering the joint purchase of the Burlington, which would make the Great Northern sole owner of that property, should the Northern Pacific fail to pay its share of interest on the purchase bonds?"

"Certainly, and vice versa," said Mr. Morgan. "That is simply a business proposition. If one partner in a concern has to pay all the debts he naturally takes all the collateral."

Mr. Morgan said that he was in Europe when he heard that the Union Pacific interests were trying to buy control of the Northern Pacific. John S. Kennedy, one of the largest Northern Pacific stockholders, met him in Europe early last May and asked him what was up in Wall Street. Mr. Morgan said that he did not know, but had been informed that Union Pacific interests were trying to get control of the road. Mr. Kennedy then said that he was going to cable over and have his stock placed in the office of J. P. Morgan & Co. He wanted Mr. Morgan's policy to prevail in Northern Pacific affairs.

"That is the way the Northern Pacific stockholders have treated me," remarked Mr. Morgan. "It is their confidence in me that has enabled J. P. Morgan & Co. to direct the affairs of the Northern Pacific road. Neither my firm nor Mr. Hill and his associates, nor both of us together, owns a majority of the stock of the Northern Pacific Company.

"When I heard that the Union Pacific interests claimed to have control of Northern Pacific I concluded that it was necessary for me to act. I had reorganized the property and felt morally responsible to the stockholders who had trusted me to preserve the stability of the property. I directed my firm to buy 150,000 shares of the common stock of the company. With that I knew that my friends and myself could control the road."

"Your firm bought $15,000,000 par value of the stock?" asked Mr. Lamb.

"Yes, sir."

"For whose account?"

"For the account of J. P. Morgan & Co. solely."

Upon his return from Europe early in July of 1901, Mr. Morgan found that his friends controlled a majority of the Northern Pacific stock. Having been asked to make up a new Board of Directors for the Northern Pacific, he deemed it his duty to act at once. He consulted nobody in making up his list of new directors, regarding the task as one imposed upon an individual trustee. James J. Hill acted with the Morgan interests all through the Northern Pacific affair, but the witness did not recollect that Mr. Hill assured him that he would "stand without hitching."

"What was your object in putting Union Pacific men on the Northern Pacific board?" asked Mr. Lamb.

"Simply to show the Union Pacific people that it was the purpose of the Northern Pacific management not to be antagonistic, but to observe the community-of-interest idea. We did not want any fighting or wrangling between two great railroad interests."

"What do you mean by the community-of-interest idea?"

"It is the idea that the men who own the railroads can do what they please with them without continual dissensions and friction. It means harmonious co-operation for the benefit of all interests. Undoubtedly the Union Pacific men were surprised when they found that I had nominated Mr. Harriman and Mr. Schiff for members of the Northern Pacific board. There was no previous understanding on this matter."

Mr. Morgan said that he first heard of the Northern Securities Company some months after his return from Europe last year. Mr. Morgan concluded that it would be to the advantage of the Northern Pacific to put its stock in the keeping of the Northern Securities Company, because such a step would practically insure stability of management and policy.

"The fact that the Northern Securities Company has a capital of $400,000,000 was an important consideration," said Mr. Morgan. "I was anxious to get a majority of the Northern Pacific stock so placed that sudden changes in the control and policy could not occur. Had we deposited our stock with a trust company having a capitalization of two or three million dollars, some competing interest might easily buy control of the trust company and do what it pleased with our stock. It is not within the range of human probabilities, however, that any single interest will be able to buy the control of the Northern Securities Company away from its present owners."

"Did not your firm sell a very large amount of Northern Pacific stock to Mr. Hill and his associates after your return from Europe?"

"Yes, we sold some stock. I do not remember the amount."

"Was it not $10,000,000?"

"It might have been. I do not remember exactly."

"Well, Mr. Morgan, a $10,000,000 transaction is a pretty big transaction."

"I don't think so," said Mr. Morgan. "When you are in transactions involving several hundreds of millions you are not apt to be impressed with a $10,000,000 transaction. In fact $10,000,000 does not amount to much nowadays. Of course, I mean comparatively speaking."

Mr. Morgan had nothing to do with the organization of the Northern Securities Company, but he approved of the scheme and he had turned his own individual holdings of Great Northern stock in that company as well as all of the Northern Pacific stock that his firm controlled. He said that he considered the price of 180 allowed by the Northern Securities Company for Great Northern stock a little low, and the price of 115 allowed for the Northern Pacific stock as pretty good under the circumstances. All things considered he thought that the Northern Pacific shareholders got the best of the bargain.

"Who fixed the price of 115 per share for Northern Pacific?"

"That was just what the 150,000 shares of stock that we purchased in May cost us. The Board of Directors of the Northern Securities Company fixed the price."

Mr. Morgan said that he had a talk with E. H. Harriman soon after his return from Europe last summer, but the latter never told him that he thought the joint purchase of the Burlington by Northern Pacific and Great Northern was inimical to Union Pacific interests. So far as the witness knew, Mr. Harriman was satisfied with the situation.

"How much of the Northern Securities stock do you now hold?"

"I decline to answer that. I do not think it fair for you to ask me about the private business of my firm."

Counsel for Mr. Power disclaimed any desire to go into the private affairs of J. P. Morgan & Co., but suggested that the amount of Northern Securities stock held or controlled by the firm might have some bearing on the general question at issue.

"Oh, well, I don't care. I am willing to tell you anything you want to know," exclaimed Mr. Morgan. "We now hold between 110,000 and 120,000 shares of Northern Securities stock."

To Mr. Stetson, Mr. Morgan said that in all that had been done to promote the plans of the Northern Pacific and the Northern Securities Companies, the idea of violating any law by restricting competition or regulating traffic rates had never been thought of. The Northern Pacific and the Great Northern were to be operated as independently in the future as in the past.

TESTIMONY OF MR. SCHIFF. (KUHN, LOEB & CO.)

"Were you not one of the men interested in Great Northern who bought a large block of Northern Pacific stock in or about the year 1897? I understand that the amount of the purchase at that time was $26,000,000."

"I do not recollect the exact amount," replied Mr. Schiff. "I was one of a number of men who bought a large block of that stock. I was acting as an individual and not for my firm. I do not remember the names of the other men and cannot say whether or not James J. Hill and John S. Kennedy participated in the transaction. My share of the Northern Pacific stock then purchased was disposed of prior to 1901."

Mr. Schiff said that some time prior to the purchase of the Burlington by the Northern Pacific and the Great Northern he held individually 20,000 shares of Burlington stock. Kuhn, Loeb & Co. bought Burlington shares during 1901.

"Was not your firm acting in this matter for E. H. Harriman and the Union Pacific interests?"

"No, sir, it was not."

Mr. Schiff said that the Burlington purchases were not made in behalf of any railroad interests to get control of the Burlington system. He did not remember how many shares of Burlington stock were bought. He had heard some talk about a joint purchase of the Burlington road by the Great Northern and the Northern Pacific, but he knew nothing definite about it until this joint purchase was officially announced. He had at no time represented the Union Pacific or Mr. Harriman in buying railroad stocks in the open market.

After the joint purchase of Burlington negotiations were opened by Kuhn, Loeb & Co. to become parties to that purchase. Mr. Hill and his associates refused to grant this request.

"How long after this refusal did you or your firm begin buying Northern Pacific stock in the open market?"

"I cannot tell exactly. It was about the same time."

"How much of the Northern Pacific stock did you buy?"

"About $78,000,000 of common and preferred. I should say about $41,000,000 of the preferred and $37,000,000 of the common."

"Were you acting for the Harriman interests or the Union Pacific Railroad in these purchases?"

"No, sir. Our firm acted on its own account."

"What eventually became of this large block of Northern Pacific stock?"

"It was turned over the Union Pacific Company, or, rather, to the Oregon Short Line. That was within a few weeks after we purchased it. Our firm had no previous understanding that such a disposition would be made of this stock, and after its transfer to the Oregon Short Line we had no voice with regard to the handling of it."

The Oregon Short Line sold its $78,000,000 of Northern Pacific common and preferred, Mr. Schiff said, direct to J. Pierpont Morgan & Co., receiving in payment part cash and part Northern Securities Company securities. The cash received was between $9,000,000 and $10,000,000 and the par value of the new securities was about $80,000,000. This transaction, the witness asserted, did not include any arrangement for Union Pacific representation in the Northern Pacific board. In the latter part of November or in December, Mr. Schiff was asked by James J. Hill if he would be willing to go into the Northern Securities board. There was also talk about the same time of giving the Union Pacific representation in the Burlington board.

"Why did the Harriman and Union Pacific interests, after buying up $78,000,000 of Northern Pacific stock, change their plans and suddenly sell out to the Morgan-Hill interests?"

"Well, I presume that the Union Pacific people thought it would be a good thing to take a profit."

TESTIMONY OF MR. STEELE. (J. P. MORGAN & CO.)

Asked if J. P. Morgan & Co. did not furnish the money to put the Burlington deal through, Mr. Steele said that his firm was instrumental in organizing an underwriting syndicate that furnished $50,000,000 in cash. A large part of this cash actually went into the transaction which culminated in the Northern Pacific and the Great Northern companies securing joint control of the Chicago, Burlington & Quincy system.

"Why was this Burlington purchase made?"

"Because the Northern Pacific and the Great Northern companies considered it desirable to secure connections which would give them permanent entrance into extensive timber and agricultural territory in the west and southwest."

Mr. Steele said that in the spring of 1901 the fact that large purchases of Northern Pacific stock were being made in the open market was brought to the attention of J. P. Morgan & Co. We believed that the control rested with ourselves and our friends, including Mr. Hill and his friends, until a little later on we had reason to fear that some of our friends had not held on to their stock. The price of Northern Pacific had advanced sharply in the Stock Exchange and we thought that some of our friends had been tempted to sell. Our firm felt that it had an implied and moral duty to perform in protecting the stockholders for whom we had acted, consequently we went into the market and bought Northern Pacific stock. There was no formal agreement between our firm and Mr. Hill, but there was an understanding that all should hold their common stock together so long as outside attempts were being made to get control of the property. We agreed not to sell any and so did Mr. Hill."

Mr. Steele said that prior to May 1, 1901, the firm of J. P. Morgan & Co. held from $4,000,000 to $5,000,000 of Northern Pacific stock on its own account. Between May 1 and May 7 the firm bought about $15,000,000 of this stock. All of this was purchased wholly by J. P. Morgan & Co. and paid for without any understanding regarding the future disposition of the stock. The firm held about $19,000,000 of this Northern Pacific stock until the middle of the summer, when James J. Hill and his friends purchased $10,000,000. The remaining $9,000,000 was held until late in the fall, when it was sold to the Northern Securities Company, payment being taken in the stock of the last-named company.

"How was it that Mr. Harriman was put on the Northern Pacific board?"

"In order to give assurance that the joint control of Burlington by the Northern Pacific and the Great Northern was not designed as a menace to the Union Pacific interests."

"Does the same reason apply to the selection of George J. Gould and Jacob H. Schiff to be members of this same board?"

"Yes, practically the same reason."

"Were there any negotiations with the Harriman syndicate for the sale of the Union Pacific's holdings of Northern Pacific stock prior to Nov. 1, 1901?"

"No, sir."

In answer to a question by Mr. Stetson, Mr. Steele said that so far as he knew, and so far as his firm was informed, there was no purpose or intent in the organization of the Northern Securities Company to suppress competition or in any way to control railroad competition so as to restrain commerce between the different States.

Another Yukon Railroad.

Opening to service of the White Pass & Yukon Railroad from Skaguay, Alaska, to White Horse Rapids, N. W. T., in 1900, marked the completion of an interesting piece of railroad building. Its construction required two years, though the length of the line is but 112 miles. While work was carried on continuously the year through it was done at a great disadvantage during the winter months, or from October to May.

The richest known gold-producing region of the entire Yukon country is in the vicinity of Dawson. At present there are two ways of reaching this section, one being up the Yukon River from St. Michael, and the other the overland route, via the White Pass & Yukon to White Horse Rapids and then by steamer through the rivers forming a continuous waterway from White Horse Rapids to the Yukon. This latter route is much the shorter, the distance from White Horse Rapids to Dawson by the steamer route being about 475 miles, or a total of 587 miles from Skaguay. From St. Michael to Dawson, up the Yukon River, is about 1,740 miles. These figures serve, incidentally, to illustrate the immensity of the Alaskan and Yukon territory.

The famous Klondike mining district lies southeast of Dawson, and this country is a network of small creeks, each draining a gold-producing valley. It is through this region that a new railroad will pass. Starting from Dawson, the line will run through the central portion of the mining district, the general direction being southeast, and the objective point the Stewart River, about 85 miles. From a point about 20 miles from Dawson a spur will be run south to a large quartz-conglomerate tract lying along Indian River. The name of the road is the Klondike Mines Railway. It is to be a 3-ft. gage, the same as the White Pass. A charter was granted to the company by the Canadian Parliament in 1899. All the preliminaries have been completed and work has already begun. The road will be built by the Hawkins Construction Co. and the work will be under the direct supervision of Mr. E. C. Hawkins, engineer, builder and former general manager of the White Pass & Yukon. No such difficulties as were encountered in the construction of the latter will have to be contended with on the new road. The grades will be much lighter, the maximum not exceeding two per cent., while the ruling gradients on the White Pass & Yukon are nearly four per cent.

A rather surprising fact to anyone not acquainted with the Klondike country is that the road will be in service the year through. The snowfall is light, and is in the form of frost, accumulating at the rate of from one-half in. to two or three in. a day, reaching a total depth of perhaps three feet during the entire winter. The only snow-fighting equipment needed will be a small pilot plow and a flanger. The White Pass road is not nearly so fortunate on account of the heavy snowfall over the coast range of mountains. During the winter season several engines and rotary snow-plows are employed in keeping the track clear from Skaguay to Lake Bennett.

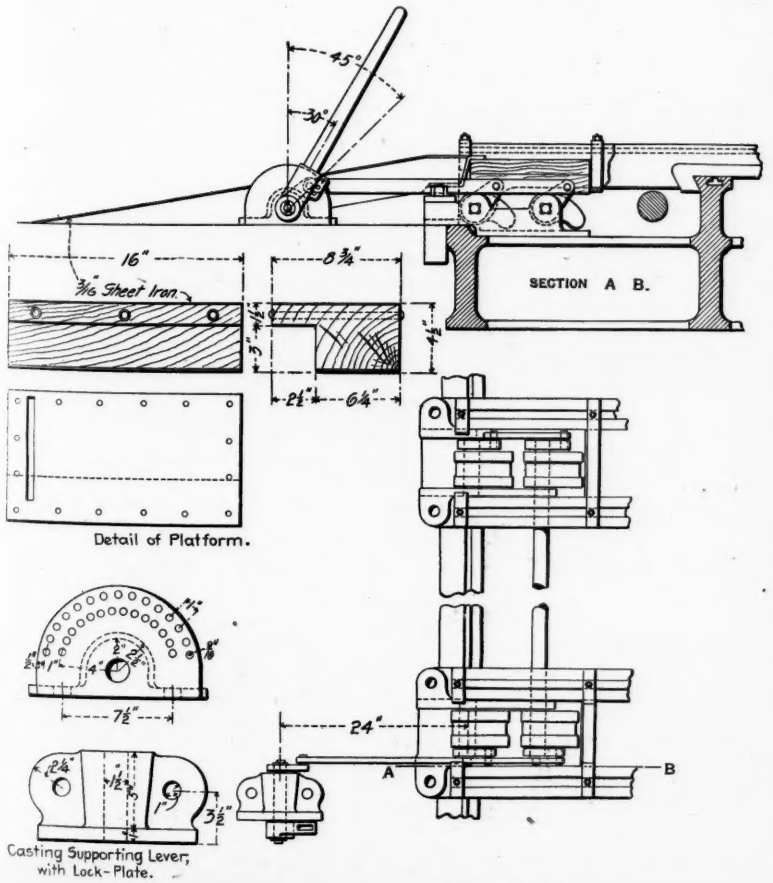
The population of the district through which the new road will pass is estimated at from 18,000 to 20,000. Along the creek valleys there is a claim every 500 ft.; on the hillsides there are five claims to each 500 ft. On each claim there are from one to 20 cabins, so that the conditions will require considerable service. There is a large volume of business carried on in this region, as all articles consumed are imported. The question of fuel in the mining district is very important, and as all of the creek valleys have been almost entirely denuded of timber, the fuel must be hauled in. Also the large amount of mining machinery being brought in each year must be handled by the railroad. In the Stewart River country thousands of tons of native hay will be cut and shipped to the mines along the route, and into Dawson. In such an active mining community travel will be heavy; in fact, it is already so over the roads and trails, and will increase when railroad facilities are afforded. In addition to all of this there are the mine products to be handled. With the exception of a railroad which runs from Lulea, on the Gulf of Bothnia, to iron mines at Malmberget in Swedish Lapland, the Klondike Mines will be the most northerly railroad in the world, Dawson being within about 125 miles of the Arctic Circle.

The stock of the road has practically all been placed and material is being bought and shipped.

A Device for Placing Axles in Wheel Lathes.

This device, an illustration of which is shown, is intended to facilitate the placing of steel-tired wheels in the lathe for tire-turning. With many such lathes, where it is impossible or undesirable to have some kind of a hoist to serve them, the wheels and axle, after being rolled into position, must be blocked up to the lathe centers. More or less time is wasted in this operation, which must be repeated in reverse order when the wheels are removed. In order to expedite the handling of such wheels and axles, Mr. Charles Lindstrom, Mechanical Engineer of the Chicago & Alton, designed the device shown, which is being used in the Bloomington shops.

Resting on the lathe bed directly under the lathe centers and held in place by suitable guides are two small platforms, 8¾ in. by 16 in., and 4½ in. thick, made of oak and protected on the under and upper surfaces by $^{3}/_{16}$-in sheet iron. A portion of the under side of each platform is cut away the full length to a depth of 3 in. for the accommodation of the cams, used to raise and lower the platforms. Mounted in suitable castings and running beneath the platforms from one to the other are two parallel shafts, 2 in. in diameter, which carry the cams above mentioned. These cams are placed tandem, and are connected together by a link, which at one end is extended out in front of the lathe to connect with a small crank mounted on a short shaft. To the opposite end of this shaft is keyed a lever, within easy reach of the lathe hand. On the casting that carries the shaft, crank and lever there is an upright semi-circular plate, 11 in. in diameter, placed so that the lever moves across its face. This plate has a double row of $^{9}/_{16}$-in. holes, concentric with its outer edge, for locking the lever in any position between limits, by inserting a pin. There are two rails or approaches of oak, faced with sheet iron, having wrought iron hooks at one end for engaging in suitable slots on the platforms.

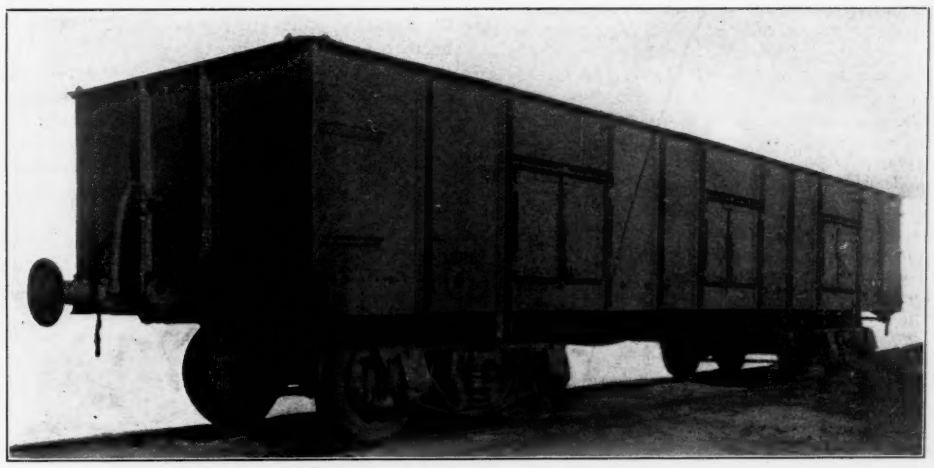


A Wheel-Lathe Accessory—Chicago & Alton.

The wheels and axle are rolled up the rails on to the platforms. The lever, being in the forward position, is drawn back until the axle centers are slightly below the lathe centers and the lever is then locked. Closing up the lathe centers raises the wheels clear of the platforms, which are left in position until the wheels are ready to be removed. The simplicity and convenience of the device make it a useful adjunct to wheel lathes.

Steel Gondola Cars for the Caledonian Railway.

The American Steel Foundry Co., St. Louis, Mo., has recently built 20 steel gondola cars for the Caledonian Railway of Scotland, one of which is shown by the accompanying engraving. Many features are in accordance with American practice. The capacity is 60,000 lbs. and the light weight is 32,000 lbs. The length over end sills is 36 ft. 5 in., the width outside is 8 ft. 6 in. and the corresponding inside dimensions are 36 ft. 4 in. and 7 ft. 10 in. respectively. The floor is 3 ft. 9¼ in. above the rail and the sides are 4 ft. 2¾ in. high. The center sills are built-up girders, with a ¼-in. web plate, 20-in. deep at the center and 10-in. deep at and beyond the body bolsters. There are no intermediate sills and the sides are designed as deep girders and assist the center sills in transmitting the load to the bolsters. It will be seen that side doors are used. The floor, end and side plates are ¼-in. steel. The end sills and body and truck bolsters are steel castings. The trucks are of the diamond frame type, the standard construction of the builders. Westinghouse air-brakes are used.



Steel Gondola Car for the Caledonian Railway, Scotland.
Built by the American Steel Foundry Co., *St. Louis, Mo.*

Foreign Railroad Notes.

December 6 the Orient express from Ostend to Vienna ran into the station at Frankfurt-on-Main with such headway that it knocked over the buffer-block, went through a massive stone wall and into a second-class waiting room. No one was hurt, but the six or eight passengers on the train and the two people in the waiting room were nearly scared to death.

The greatest of the French railroad companies has decided to build dwelling places for its employes at all places on its lines, where suitable accommodations are hard to get.

The Berlin State Railroad Director has issued a "stock-train guide" showing by what trains and connections cattle can be shipped to Berlin from all its chief sources of supply.

The railroads of Austria, Hungary and Bosnia have granted a new privilege to their employees. When one of them dies while traveling on duty, his body will be carried home (by freight train) free of charge.

On three of the railroads entering Berlin third and fourth tracks have been begun, to extend as far as the suburban trains run. On one road experiments are made with electric trains running to Wannsee, and on another line it is intended to run all trains, suburban and other, by electricity for six miles out of Berlin.

The 2-ft. gage railroad, which the Germans are building in Southwest Africa, in October had the rails laid for 178 miles from the coast at Swzkopmund northeastward towards Windhoek. The newer part of the road is in an arid country where it is difficult to find water for the engines. Railroad troops are building and working the road.

The two signalmen between whose signals (Keimberg and Schierenberg) lay the section on which the collision occurred December 20, and also the conductor of the train which was run into, are to stand trial for criminal negligence; the conductor for not sending back a signal when his train was halted to remove a dead horse from the track.

Otto de Terra, a railroad officer of nearly the highest rank in the Prussian railroad service, has organized a Railroad Man's Total Abstinence Society, and starts with about 120 members, some of them officers. He has long been an advocate of temperance, but his advocacy of total abstinence seems not to be generally approved by the railroad officers.

The International time-table convention last December made provision next summer for a connection of trains from Vienna on the west with Kieff and Odessa in Russia, and for some other connections with Russia which indicate that the latter country is getting into closer touch with Western Europe. The time of the evening train from Vienna to Paris is to be reduced to 27½ hours.

The German Dining Car Co. reports for the year ending with September last that it had dining cars on all through express trains in Germany, and on some others, 32 in all. It has 38 cars, which have cost about $422,500. Its gross earnings were $250,320, and the net $43,837. A dividend of 10 per cent. was paid, a very small part of which was supplied from the surplus of the previous year.

The company working electric street railroads in Vienna asked the government authorities for permission to provide for a certain number of "standing-places" in its cars. But the government inspectors said no. Electric cars stop and start so quickly, they said, and change speed so much and so often, that passengers might be thrown against each other and discommode the seated passengers! It is intimated that there are cities where the electric cars, without providing standing-room, sometimes carry standing passengers. It is to be feared that Vienna is behind the age.

On the 25th of February there was a debate in the House of Commons on the working hours of railroad employees. A catch vote at the end placed the government in a minority of 7, but the debate was interesting from the part that Mr. Bell, one of the leaders of unionism and now member for Derby, took in it. In the course of his speech, which was the longest on the motion, he made various statements concerning the long hours worked continuously by men in many grades. He said that the maximum of 12 hours was considerably exceeded even now, and that the act of 1893, enforcing this limit, was a dead letter. He instanced cases in which, on the Great Central, men had worked 72 hours 20 minutes in five days. On the Midland he instanced numerous cases in 1899 where guards worked in a week from 84 to 116¼ hours; on the Midland and South Western joint line, he spoke of one driver on duty for 31 consecutive hours. He praised the London & North Western for its adherence to the 12-hour day under all circumstances, and wished that the other companies would do the same. Mr. Jackson, the chairman of the Great Northern, spoke in answer to the charges of Mr. Bell, and emphasized the difference between being on duty and on the foot plate. He said that during 1901 the complaints were only 19 in number on his line.

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The inspectors for the British Board of Trade have reported on the fire which occurred last December in the tunnel section of the Liverpool Overhead Railway. An extract from this report appears on another page and will be read, we are sure, with a great deal of interest. It will be seen that the report sustains, precisely, the position taken by Mr. George Westinghouse (and also by the *Railroad Gazette*) in the discussion which arose after the accident in the New York Central tunnel. The report recommends that the use of wood should be reduced to the lowest quantity in stations, signal-houses, and other fixed structures, and that there should be little or no wood about an electric locomotive or about the cab of a motor car, and that the resistances and switches should be put, so far as possible, outside the cab. It recommends also, that the conductors should not be covered with combustible material and that care should be taken to avoid smoke, which would be apt to cause a panic, even if it did no other harm. We suppose that all these simple elementary points are understood and thought about by engineers designing electrical installations; but that the conditions under which they work compel them to use cheaper methods of construction. Now they will be fortified by an authoritative and carefully considered report. It is quite obvious to anybody who thinks about the matter, that the installation of electricity for working tunnel railroads will have to be modified considerably from existing practice if we are to escape great perils.

In the last few months, we have repeatedly taken occasion to speak of the probable advantages of the general use of the high speed brake attachment in general passenger service. It has seemed to us that for several reasons the high speed brake may profitably be used, not alone in very fast express service, but in local runs and in suburban service. It is not very unusual for trains that make comparatively frequent stops to go up to maximum speeds quite as great as those reached by long-run express trains; while for suburban service, the power of making a quick stop is an important help in reducing the time spent on the run, for the well recognized reason that speed can be kept up longer and the curve of retardation be made sharper. That is, for purposes of safety the high speed brake is quite as important on local trains as on express trains, possibly even more so. As a means of shortening the time from terminus to terminus it is a good deal more important in suburban service than in express service. In other words, the development of this device has long seemed to us to be another very important step in air-brake practice, in which practice we lead the world, far and away. Some of the daily newspapers have said within a few days that the Pennsylvania Railroad is to adopt the high speed brake for general passenger service. This is undoubtedly true; the official announcement is not made, but we are willing to risk something on the statement that the high speed brake is to be used on all Pennsylvania passenger equipment, locomotives and cars, both east and west of Pittsburgh. Assuming that this is true we venture to congratulate the officers of that railroad on having done another enlightened and enterprising thing in railroading.

Mr. J. C. Whitridge, who has been for six years one of the Associate Editors of the *Railroad Gazette*, left our service on the first of April to take a position with the Buckeye Malleable Iron & Coupler Company at Columbus, Ohio. He goes there as assistant to Mr. Bush, the General Manager. It is probably pretty well known that this company is now building an important plant for making steel castings; and a great opportunity is open for young men of character and ability who are so fortunate as to become associated with the enterprise at this moment. Mr. Whitridge entered the service of the *Railroad Gazette* under Mr. Barnes at Chicago, immediately after leaving Purdue University. On the death of Mr. Barnes in 1896 Mr. Whitridge became Associate Editor in charge of the editorial office in Chicago, and from that time to this, he has been an important member of our staff. His ability has been demonstrated and is widely recognized. He is so modest that he has to be found out, which may or may not be a defect of character; at any rate, it is an agreeable and attractive quality. But he has that which is better than ability, which goes further and lasts longer, namely, he has loyalty, honor and a sense of duty. We feel certain that his success is assured wherever he chooses to go.

The Movement Toward Consolidation of Railroads.

The examination of J. Pierpont Morgan and others concerned in the organization of the Northern Securities Co. and in the stock purchases in which the Union Pacific and the Great Northern contended for the control of the Northern Pacific, has naturally attracted much attention. The new facts developed have been more interesting than important, perhaps; but the whole transaction, or series of transactions, the objects aimed at, the methods followed, the probable effects on the interests of the railroads, of the different classes of their owners, and on the public which the railroads serve, deserve all the attention they are likely to get, and more profound and broader consideration than either statesmen or railroad managers seem to have given.

The American public was taught by half a century's experience to look upon railroad competition as one of the chief means of increasing wealth. A country with enormous areas of fertile land, forests and mines can avail itself of such resources only when means of transportation are afforded. A new country in which most of the people are landholders will favor whatever policy gives most railroads and gives them most quickly. As time passes and the railroads are provided, further progress—further increase in the value of lands, etc.—depends largely on reduction of transportation charges. This usually follows when the different lines approach and cross each other, until the country becomes generally occupied; though still the greatest benefit to the public at such times is oftenest from the competition of different companies in building new branches and extensions—to occupy a field not then but likely thereafter to be profitable. Very great waste has been made in building such lines before their time, and in duplicating lines; but the loss has not fallen upon the communities served by the new lines, but rather on the public at large; and such communities enthusiastically favor a policy which makes their wild lands valuable at the earliest possible moment. As time passes the public insists on looking for further advantages from the cheapening of transportation in the same way in which it got the first—by continued and extended competition; although it is demonstrable that the cost of the transportation must be increased by such competition, and therefore that the price of transportation might be reduced by its suppression.

Naturally, though, and properly, the community takes little interest in a policy by which millions may be saved, unless it is assured some share of the savings. It will not, however, after a country has been fairly well supplied with railroads, be able by legislation to compel the companies to compete, and such competition as results in temporary cut rates, railroad wars, etc., on the whole is an injury to it. The Inter-State Commerce law has substantially given two commandments: 1, "You shall compete"; 2, "You shall charge all alike"; and the public seems not yet to see that the justice of the second commandment is substantially made impossible by the first.

Railroad-owners, of course, make every effort to protect their property, and in many cases the question of competition has much less to do with the measures taken than the action of other groups of railroad-owners. To go back of any recent movement, take the lease of the Pittsburgh, Ft. Wayne & Chicago Railway by the Pennsylvania, at a time when another interest was about to deprive it of this, its chief Western connection.

Very much may be said against a policy which permits such tremendous transformations in the railroad system without consulting representatives of the community or the great mass of the proprietors of the railroads themselves. In no other country would it be possible. But this is the way in which railroad policies are framed and carried out in this country, and under the condition of things actually existing; and it is only in some such way that anything can be done. The public, it is conceivable, could secure its own best interests, the rights of all railroad proprietors, and at the same time favor the most economical organization, inter-relation and management of the several railroad systems, but it has here and now no suitable machinery for doing this; and those who have an adequate conception of the subject are few and apparently without influence; while the public at large seems to look upon the matter as one which may be settled by half a dozen legal prohibitions or commands.

That no rational solution of the question is in sight, however, does not mean that none will be found, though we now seem likely to be long in finding one. Probably the public will in time learn that an ideal railroad policy is not secured by maintaining the largest possible number of conflicting organizations; but, on the other hand, before the railroads of the country have been united into six or eight great systems, controlled by three or four financial syndicates, the community will be pretty sure to have exacted definite and enforceable provisions for the protection of its interests.

Passes and the Conventions.

We spoke last week of the probable effect of pass limitations on the attendance at the Air Brake convention this month. This is also causing a good deal of concern in the Master Mechanics' and Master Car Builders' Associations. The conventions are to be held at Saratoga, beginning the third Wednesday in June, and as things stand now it will be necessary for Western members to pay fare east of Buffalo, and the majority of Eastern members will be little better off. It is feared that this will materially cut down the attendance. Many young men and men in subordinate positions pay their own expenses at these meetings, and the additional expense of railroad fare will keep many of them at home. These are really the men who get the most good out of the meetings, and in turn their roads are most benefited by having them go to the conventions.

There would seem to be two ways out of this difficulty: Issue transportation to and from Saratoga conventions on account of the Master Mechanics' and Master Car Builders' Associations and not on account of individual roads. Or better, let each road send its mechanical men to the conventions and pay all their traveling expenses.

The reports this year will include a number of important and live subjects, as for instance: Steel car repairs; maintenance of air brakes; results of draft gear tests; cast iron wheels; standard outside dimensions of box cars; ton-mile statistics; cost of running high speed trains; modern roundhouse facilities; improvements in boiler design, etc. Of course the topical discussions always bring out a lot of interesting and useful information.

The man who stays at home and reads about the conventions misses the spirit of the thing; he misses the unofficial discussion which goes on outside the convention hall, and misses an important feature of the conventions—the exhibits. We venture to say that he will be a poor man indeed who does not pick up enough good ideas and facts to directly pay his road for sending him to the Saratoga conventions. It is really a business proposition. If there is any doubt about the value of the work done at these meetings, we would suggest a test. Require each man to keep memoranda of the points brought up and the things he sees that are applicable to his own road, and include these in a report to his higher officer on his return. It will not be hard to determine whether the time and money spent at the conventions is well spent. Our notion is that there will be

no falling off in attendance at this year's conventions if this matter is properly presented to the managing officers.

The State Railroad Policy in France.

The vote in the lower house of the French Parliament, Jan. 23, instructing the Minister of Public Works to take steps to acquire for the State the systems of two of the six great railroad companies, the Western and the Southern, seems to have been a great surprise to the administration and to the Parliament itself, and to have been voted for, in the main, by deputies who had no idea that the measure would be carried out, or could be at this time. Doubtless they, or most of them, would like to see the French railroads worked by the State, but the obstacles at this time are enough to discourage any practical man. The present administration is the most radical the republic has ever had, and a very large part of the Parliament is Socialist. The Minister of Public Works himself only two years ago announced that he favored the State Railroad policy, and promised to make the studies and investigations necessary for a practical plan for effecting it. This he has not done, doubtless because he soon learned that the financial difficulties make it idle to think of it at this time. The whole cabinet, including one member who is a Social Democrat, united in opposing the motion; but it was carried nevertheless by a vote of 272 to 260, and it was even refused to refer the resolution to the Railroad Committee to report upon; for the resolution was offered by a single one of its members, and could not have carried the committee. The explanation of the vote is that the Parliament is about to expire and its members, many of whom when elected were pledged to favor State purchase, wish to redeem their pledges before standing for re-election.

The most serious agitation in France for uniting the railroads in a State system was about 1882, when the question was seriously discussed for a long time. It resulted, however, in a series of new contracts with the six great companies, in 1883, by which the latter undertook many new lines and made various concessions to the public, in return for which the State extended the time for which it guaranteed dividends and interest on the capital of the companies, and postponed the date at which it will become the proprietor of the railroads. For the original government guarantee provided for a sinking fund which generally would have retired the capital advanced by the companies within 50 years. By the existing contracts this time will not come until dates which fall between 1954 and 1960. These contracts give the companies rights, and probably the State cannot legally acquire the railroads before that time except by negotiations with them and their free consent, or by long-lasting and costly proceedings equivalent to our exercise of eminent domain.

The motion to acquire only two of the six great companies, made by Jean Bourrat, the most prominent advocate of the State system, which he has long advocated in a way which proves that he is a convinced partisan of the policy and more than usually well informed of the circumstances, was because these two systems include between them the very imperfect existing State system; and M. Bourrat, in this particular differing from many of those who follow the leading of their "general principles," without the least regard to the existing facts, was willing to have an experimental trial of government working, on a field extensive enough to test it, before undertaking the whole French railroad system, which, he expects, would follow. In the debate over his motion a still more radical deputy moved to include all the six great companies, and his motion received 214 votes against 303, though many Socialists opposed it as likely to be fatal to any progress towards a State Railroad system.

To an understanding of the feeling in France it is necessary to remember that the railroads of the six great companies—some three-fourths of the mileage of the country—are actually already in fee the property of the nation, and are worked by the companies on what is practically a long lease. The State has built the whole substructure; it guarantees interest on the capital supplied by the companies, and at the expiration of the term specified in the contracts ("cahiers de charge") the railroads will revert to it. The rolling stock is entirely the property of the companies, and when it takes the roads the State will have to buy it on terms to be fixed by arbitration if not otherwise agreed upon. The larger number of the companies continue to call on the State for considerable yearly advances to pay interest and dividends; though this is largely due to the local lines of light traffic the construction of which has been imposed upon them by the government. The whole system is almost as far from the private railroad systems of this country and England as it is from a purely State railroad system. Public opinion concerning it seems very much divided. A part of the community seems to cherish a bitter feeling against the six great companies; but these naturally exert a tremendous influence, and outside of their employees there is not much expert opinion in the country. They offer to the two great technical corps of the State, that of mines (largely mechanical engineers), and that of bridges and highways, the most promising careers, which their members can follow without leaving their corps. Doubtless the property interests in France favor the existing system, but it is largely because they look upon the movement towards a nationalizing of the railroads as a socialistic movement, likely to be followed by the nationalizing of other industries. On the other hand, France is now surrounded, except on the side of the Pyrenees, by countries where the State Railroads system prevails, and in one of these, Prussia, it has been a great success, and is able powerfully to support the national industries in their competition for the supply of foreign countries; though so far they have strengthened the national exchequer rather than the national industries. It is probable that some French interests hope that they would be helped in their competition by a State Railroad system; but it is doubtful if the State would do more for them than the companies, which will do almost anything, except lose money, to prevent a diversion of traffic; and France, which is not an iron and coal exporting country, is not affected by railroad rates nearly so much as Prussia and Belgium are.

A distinguished Government official, noted for his perfect familiarity with a complicated code of statutes which governed the operations of his office, was asked by an admiring friend how he had succeeded in getting such a thorough knowledge of those intricate laws. "By breaking them," was the reply. After you have broken a law your vision is wonderfully clarified, all of a sudden. The same truth crops out in another shape, when one reads the records of the decisions of the Courts. If there is any possible phase of the laws—one might almost say any possible phase of human activity—that has not been fully elucidated elsewhere, look in the Court decisions and there you will find it. Every decision has been made necessary by some wrong or discord. This thought has been brought to mind by the collision at Girard, Ohio, showing the need of the block system, which appears in the February record, published in our last issue. We thought that our accident record, embracing a long series of years, had already given examples of all of the contingencies in train-running which show the need of the block system, but now we have one more. At least, it is one that we do not recollect having seen recorded before. It is by breaking the rules of safety that we find out how varied an assortment of such breakages is possible. If we keep up the study long enough, we shall finally have to conclude, no doubt, that the block system is needed everywhere. Up to the present time the need exists under the following classes of circumstances:

1. On all roads having frequent trains running at high speed.
2. All roads, without regard to frequency of trains, in time of violent snow storms when torpedoes and fusees are not reliable; or in extreme cold weather, when a brakeman must risk his life to guard his train.
3. All roads, or parts of roads, where there are tunnels through which a brakeman cannot easily and safely find his way and exhibit his signals; or where there are bridges across which a man cannot readily walk at all times without risking his life.
4. All roads (on the open road as well as at tunnels and bridges) where a brakeman *can* walk with safety but where sometimes he *won't*; in other words, where the discipline of brakemen is not maintained at the very highest standard.
5. Roads having three or four main tracks. On such a road, a train is liable to come up behind a preceding slower train under such circumstances that the engineman cannot tell whether the slow train is on the same track with himself or on an adjoining track. This complication, making it difficult to guard against rear collisions, is also present in all cases where two railroads lie side by side, without regard to whether they have one, or more than one track, each.
6. And now, finally, we see that this danger in regard to rear collisions also exists as regards butting collisions.

Possibly some reader may think that our fourth class is somewhat too comprehensive. If there be such a reader he is the one for whom we wrote that paragraph. We shall be glad to entertain a motion from him to strike it out, provided he can find any experienced railroad officer who will have the temerity to second the motion.

It is not often that a single railroad contest shapes the work of a constitutional convention on a vital State reform, but such has been the case in Connecticut. In the last Legislature of that State the long and rancorous controversy over the 313 ft. of land on the "Montague farm" will be recalled. Briefly re-stated, the New York, New Haven & Hartford bought up that farm, lying in a notch between two mountains, broke the layout of the Tariffville branch of the Central New England, resisted, successfully, two appeals to the courts and finally defeated in the State Senate a healing act after it had passed the lower house. The New Haven won only by concessions to trolley companies seeking parallel extensions. The strife and its climax roused acute feeling throughout the State, but especially in Litchfield County, which would have profited by the opening of the branch and which, in the convention now sitting, has 26 delegates out of 168. Those delegates, reflecting the wishes of their constituents, were almost solid in favor of an increase of the Senate from 24, the present number, to 60, so as to check the power of the corporation; and their votes and influence have carried through the change. But this is not all. Closely blended with the "sixty" Senate was the plan of one representative from a town in the lower house, intensifying the strange Connecticut "rotten borough" system which has been for so many years the target of reform criticism. "One-sixty" then became a rallying point of the small towns and, without a single vote to spare, has gone through the convention and into the new Constitution as a sequel of the Montague farm contest which, indeed, was one day revived in the debate. A satirical commentary on the situation is that "one-sixty," the indirect if not direct product of hostility to the New Haven road, has probably so "loaded" the new Constitution that it will be rejected by the people and the corporation will retain its small Senate after all. Meantime the right-of-way case has gone once again to the Connecticut Courts and the Central New England, taking this time no chances, is building a loop several miles long around the disputed land.

The Russians have made considerable extensions of their Asiatic Midland Railroad, in Turkestan, of late years, and have lately discovered that great frauds have been practiced in connection with them. One of these consisted in selling lands for right of way, etc., which already belonged to the government, and this has been practiced on a very large scale. Attempts have been made to throw the responsibility on the official interpreters, through whom most of the business must be transacted. Apparently a clear case is made against the interpreters; but a very large class of other officials, reaching pretty high up, must have co-operated with them, as the maps used plainly showed what was public land, and there was no excuse for auditing a bill for paying for any of it. Long ago, when the main stem of this railroad was built from the Caspian eastward, the general officer in charge absorbed millions from the sums advanced by the government. He pushed the work with tremendous energy, and made a "record" for rapid railroad construction which the Russians delighted to boast of; and not till years after were his evil practices discovered, and he disgraced. The frequency with which people treat Russian government business as a proper subject for loot has perhaps no modern parallel, except in our larger American cities.

The perplexing problem of telephoning from a passenger car, which has well nigh baffled the electrical savants of the general passenger agent's office of the Chicago & North Western, has at last been solved. After much investigation and research, undertaken (at great expense) with a view to preventing any possible hitch when they should proceed to carry out their advertised scheme of providing regular telephone connections with their Overland Limited train while it is standing at the terminal stations, preparatory to departure, the G. P. A. in Chicago and the G. E. P. A. in New York, on Saturday, March 29, along about the hour of early candle-lighting, succeeded in actually talking with each other. What they said is not recorded; but there is no doubt about it, for the thing was done "in the presence of a number of newspaper men." And, what is still more important, the event fills 3⅞ in. in the New York *Commercial* and no less than 8⅜ in. in the New York *Sun*. Other papers are yet to be heard from; but it is safe to say that the *Sun* will lead the list.

NEW PUBLICATIONS.

Specifications for Bridges Carrying Electric Railroads.—Last December the Massachusetts Railroad Commission adopted a set of specifications for bridges carrying electric railroads, these specifications having been prepared by Professor George F. Swain, Bridge Engineer to the Commission. The pamphlet can doubtless be had on application to the Commission. The aim is obviously to secure good, sound, safe practice in bridges for electric railroads; for which there is great and notorious need. We shall not now attempt to give many of the particulars of these specifications. For bridges built exclusively to carry street railroads outside guard timbers are provided, to keep the ties in place, and inside guard rails (same form and height as the track rails) are provided to help matters in case of derailment. Pony trusses are allowed only by special permission of the Board. A liberal but not unreasonable live load is specified, and distinctions are made between bridges designed exclusively to carry street railroads, and those designed to carry highways in the city, in the country and in small towns. The allowable stresses on timber and steel are specified and pretty full requirements as to details of design are laid down.

TRADE CATALOGUES.

Water Softening and Purifying.—The Industrial Water Company, 15 Wall street, New York, has sent out a new illustrated catalogue of 17 pages, showing some of the plants recently installed by the company. One of the most interesting illustrations is that of the Rio Grande Western purifying plant at Helper, Utah, the continuous automatic output being 5,000 gallons per hour. The catalogue is issued under the caption, "Hard Water Made Soft," and will be found very interesting.

Willis Shaw, Chicago, Ill., has issued an interesting little booklet of second-hand machinery. Among the items offered for sale are 13 narrow gage locomotives, more than 650 dump cars of different capacities, 300 standard gage freight cars, 15 steam shovels, 27 hoisting engines, eight derricks, six excavators, 17 rock and stone crushers, 16 road rollers, 32 pumps, 24 air compressors, 20 boilers, together with a lot of miscellaneous machinery.

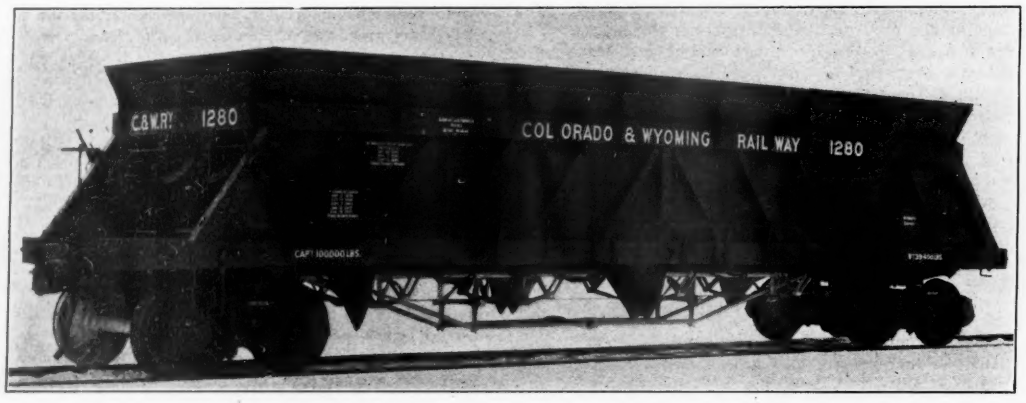
Milling Machines.—The Cincinnati Milling Machine Co., Cincinnati, Ohio, has just issued its 1902 catalogue. It contains 90 pages of illustrations, descriptions, etc., of the line of milling machines and cutter grinders made by the company. A number of the machines shown in the catalogue contain improvements over those which appeared in former catalogues. Among these improvements is the application of the Cincinnati Milling Machine Co.'s new all-gear feed mechanism, whereby all feed changes are instantly obtained by movement lever, the drive being always positive, permitting much heavier and faster cuts than with the old belt-fed mechanism.

Test of an Ingoldsby 100,000 lbs. Capacity Wooden Dump Car.

The illustration shows car No. 1,280 of the Colorado & Wyoming, for which a number of 100,000 lbs. capacity, wooden dump cars are being built at the Detroit shops of the American Car & Foundry Co. These cars are of the new style of the Ingoldsby Automatic Car Co., of St. Louis, Mo. The cubic capacity is 2,130 cu. ft., equal to 110,700 lbs. of coal. The record shows that the car stood up remarkably well under 160,600 lbs. of load and very rough usage, and we are informed that 235,000 lbs. of wet iron-ore was subsequently loaded upon the same car, successfully carried, and unloaded by one man in one minute. The following extracts are from the report of a test made at Detroit by Mr. F. R. Bowling, Mechanical Engineer for the Ingoldsby Co.:

The car had a camber of ¾ in. on one side truss, and 1⅛ in. on the other side truss, the center member being cambered 1 in. The car was first loaded with 96,320 lbs. of pig iron and showed ⅝ in. deflection on one side truss, and $^{9}/_{16}$ in. deflection on the other side truss. The car was then drawn over frogs and switches, and around sharp curves, and showed no defects. It was then loaded with car wheels to 145,050 lbs., and showed a further deflection of ⅝ in. on one side truss and $^{5}/_{16}$ in. on the other side truss. A further running test including heavy buffing and running over obstacles placed on track showed no defects. The foregoing deflections were mainly the result of all parts of the new car coming to a true bearing.

Additionally loaded with car axles to 151,050 lbs. both



The New Ingoldsby Wooden Dump Car—Colorado & Wyoming.

side trusses showed additional deflections of ⅛ in. Tested as before, no defects developed, and the car was then loaded with more axles to 160,600 lbs., both side trusses showing additional deflections of ⅛ in. The car was then run over frogs, around curves and over obstacles placed on rails, and had several cars in line buffed into it, and as a final severe test, was given a long run and sent into a train of 10 cars standing still. Two couplers were broken on the string of 10 cars, and the new car was uninjured.

The total deflection of the side trusses under this excessive loading was 1⅛ in. on one side truss, and 1⅜ in. on the other side truss. The total deflection of the center member was 1¾ in. When the car was emptied, the side trusses returned to a camber of ½ in. on the side, which had an original camber of 1⅛ in., and to a camber of ¼ in. on the side which had an original camber of ¾ in. The weights were first ascertained from the amount of material placed in the car, and these figures were checked by actual weighing each time on railroad scales.

The foregoing test covered a period of three days, during which time the average temperature was 32 deg. Fahrenheit. As a part of the load was of new Pennsylvania railroad axles, it was out of the question to dump them for fear of injury to the axles, and as the car wheels were to be reloaded on a flat car, both the axles and car wheels were first removed by a crane, but the remaining pig iron in the car was dumped. This 96,320 lbs. of pig iron was loaded in the car in two piles, each pile weighing about 48,000 lbs. and being placed close up against each side of the car. One side of this car was dumped by one man in 10 seconds, and the lunge due to the remaining 48,000 lbs. on the extreme opposite side of the car was hardly perceptible. The only evidences of excessive loading and severe tests were slight cracks in the lower chords of the side trusses, caused by the washers being crushed into a good bearing.

The New Electric Railroad at Berlin.

The Berlin elevated and underground electric railroad was opened for traffic on Tuesday, February 18. Berlin possesses, besides a comprehensive system of electrical surface tramways, an elevated steam railroad (Stadtbahn) in two loops, which traverse the city in the form of an elongated figure 8, and a so-called "Ringbahn" or belt line of electrical surface roads on which cars make the circuit at frequent intervals and in opposite directions. But as long ago as 1892, it became apparent that these were inadequate to handle the growing traffic of the central portion of the city. Messrs. Siemens & Halske petitioned for a franchise to build and operate an electrical railroad which should be subterranean in the densely built central portions of the city and elevated in the southern and western precincts. The franchise was granted March 22, 1893, for a term of 99 years. Actual work was begun Sept. 10, 1896. The organization of the company was completed April 27, 1897, when the Deutsche Bank became the financial backer of the corporation. Its capital is 25,000,000 marks ($5,950,000), one-half of which is represented by 4 per cent. bonds, the other half being ordinary stock shares. This company entered into a contract with Messrs. Siemens & Halske, owners of the franchise, by which the corporation acquires all rights and privileges previously granted to the firm. Messrs. Siemens & Halske on the other hand agreed to build and equip the road and operate it for one year, with a guaranteed net profit of 4 per cent. on their investment, and one-fourth of the net earnings above the guaranteed limit. After the road shall have been thus operated for one year by its builders, it will pass into the permanent control of the company.

The municipality, in August, 1897, granted right of way for the entire distance, viz., 6.5 miles. For the use of this right of way, the company is pledged to pay to the municipality of Berlin 2 per cent. of its annual earnings up to $1,428,000. If they reach $1,666,000 the percentage will be 2¼ per cent., and so on, one-fourth of 1 per cent. increase for each additional million marks earned. From the beginning of the fifth year after the date of granting the franchise, not less than $4,760 shall be paid as such percentage. Thirty years after the road shall have been opened, the three municipalities have a joint option of 10 years' duration during which to purchase the entire property at a fair valuation.

The wholly underground section of the road which leads from Potsdamer Place northeastward to the Alexander Platz beyond the river will not be commenced until the overhead sections have been operated and their efficiency, both technical and commercial, demonstrated by experience. These two sections start from a common underground terminus at Potsdamer Platz. From this starting point, the new line runs underground about 200 yds., passing beneath the Potsdam Station; thence mounting to a steel overhead construction, it continues south-westwardly about a quarter of a mile and crosses the Landwehr Canal. At this point, the line is divided by a three-cornered switchback, one side of which curves at a radius of 296 ft. and the other at a radius of 263 ft. From this junction one branch, all of elevated construction, extends eastward through a south-central and densely built industrial and commercial quarter to the Stralauer Gate, crossing the River Spree on a beautifully designed bridge of red brickwork, over which the electric line passes along a handsome arched viaduct about 20 ft. above the roadway. This eastern branch is about 3½ miles in length, and has eight stations, two of which are located north of the river.

The other branch turns westward from the switchback junction and passes on overhead constructions of steel and masonry through the Dennewitz Platz, follows the Bülow Strasse through a superb station at Nollendorf Platz, and then, descending a sharp grade, passes through a tunnel nearly a mile in length to a subterranean station adjacent to the Zoological Garden Depot of the overhead city and long-distance steam railroads. This western branch is being extended two miles farther to the Wilhelms Platz, in Charlottenburg. It has at present five stations, two of which—Bülow strasse and Nollendorf Platz—are overhead, the three others, including the two terminals at Potsdamer Platz and the Zoological Gardens, are underground. The largest station on the entire system is the eastern terminal at the Warschauer Bridge. It is in the form of a curved viaduct, 300 meters (976 ft.) in length by 27 meters (88 ft.) in width, with three platforms, each 250 ft. long. The line is double tracked throughout, and trains are run in either direction at intervals of five minutes during the busy hours of morning and evening, and at 10-minute intervals during the middle of the day and after 8 o'clock in the evening.

The power plant includes three direct connected dynamos, each of 800 kilowatt capacity, driven by three steam engines, each having a normal efficiency of 900 effective h.p. and a speed of 115 r.p.m. The engines are supplied by six boilers of the Gehre type. The furnaces are fed automatically from above with coal brought from canal boats by means of a Hunt conveyor.

The current is conducted to the cars by a third rail laid between the two inner rails of the double track and insulated from the steel superstructure by wooden blocks, interlaid with layers of felt. The trains are made up of three cars each., viz., a third-class car front and rear and one for second-class passengers in the middle. Both third-class cars are motor vehicles and seat 40 passengers each. The middle car seats 44 passengers, so that, as no standing in aisles or on platforms is allowed, the capacity of a train is limited to 124 passengers. The system of propulsion employed is that of locomotive control, not the multiple-unit system.

Each car is provided with pneumatic brakes, runs on two four-wheel trucks, and every third-class car carries at one end three electrical motors of 71 h.p. each, which operate both axles of the truck. The motor car, with its complement of passengers, weighs about 26 metric tons. The motors are designed for an average service speed of 30 kilometers (19 miles) per hour, with a practical maximum of 50 kilometers (31 miles), which is the limit of speed permitted on the line.

Some of the New and Enlarged Bridge and Structural Mills.

The increasing demand for bridge and structural material has caused nearly all the manufacturers to improve their plants to increase capacity. In our issue of March 14, page 176, we mentioned some of the new companies and also described some of the recent improvements by existing companies. Additional information follows:

The West Virginia Bridge & Construction Co. is the most recent company formed to build bridges. Its capital stock is $500,000 and it will build a plant in Wheeling, W. Va. The directors are: C. R. Hubbard, President of the Wheeling Steel & Iron Co.; George A. Laughlin, of the Laughlin Nail Co.; J. H. Barrett, of Pittsburgh, formerly with the Keystone Bridge Works, and recently Manager of the Columbia Bridge Co., of that city; W. E. Stone, W. A. Wilson, J. M. Brown, J. M. Holloway. Mr. Barrett will be General Manager. The company will also make general structural work and the Manager will have charge of establishing the plant. It is said work will be begun soon and that the contracts for buildings and machinery will be let within a week or so.

The Riverside Bridge Company has an application before the West Virginia Legislature to incorporate with a capital stock of $200,000. It proposes to locate north of Martin's Ferry. The application is signed by Nelson E. Whitaker, Henry Schmulbach, John A. Howard, F. J. Park and O. R. Wood.

A large plant is being built at Berlin, Conn., by the Berlin Construction Company of that city. The company has since last May been operating, under lease, the Pottsville Bridge Works at Pottsville, Pa., the capacity of which is about 3,000 tons per annum, principally structural work. Its new works in Connecticut, which will be operated entirely by electricity, will have a capacity of 6,000 tons per annum. It has already bought a complete new equipment for the Berlin plant.

Another new bridge plant in New England is that of the Boston Bridge Works, which has been entirely rebuilt within the past year and a half. Since the fire which destroyed the former works the company has been using temporary shops. The new works will turn out, when fully equipped, from 18,000 to 20,000 tons per annum. The buildings are of brick and steel construction to make them as near fire-proof as possible, and the lay-out and equipment is thoroughly modern in every particular.

The Riter-Conley Mfg. Co., of Pittsburgh, Pa., is making extensive improvements. It has just finished a new office building at Pittsburgh, and is now extending its main structural shop at its Allegheny plant on Preble avenue, Allegheny. This extension will be approximately 120 x 225 ft., provided with electric traveling cranes. The company is also erecting the steel frame for a new plate works shop at Leetsdale, on the Pittsburgh, Fort Wayne & Chicago Railroad, about 15 miles below Pittsburgh, on the Ohio River. In this instance the main shop is approximately 85 ft. x 600 ft. long, with a power house 50 x 125 ft., and a sheet-iron shop 50 x 250 ft. This plant will be provided with electric overhead traveling cranes and all the machinery is to be operated by electric power, to be supplied by alternating current generators driven by gas engines. This plant for the present will be a branch of the Pittsburgh Works, which will still remain in operation.

The works of the Virginia Bridge & Iron Company, at Roanoke, Va., have an annual capacity of 10,000 tons, an increase of about 3,000 tons in two years. The punching and riveting capacity of the works has been increased during this time and the company contemplates adding several heavy cranes to facilitate the handling of material. It is now negotiating for these cranes. It also has under consideration further improvements to increase the capacity of its shops, but has not yet made any decision as to the extent of the improvements.

The capacity of the Structural Iron & Steel Company's works at Baltimore is 6,000 tons per annum. The company is now making an addition which, with the new machinery and increased facilities for handling work, will add about 25 per cent. to its capacity.

The Bellefontaine Bridge & Iron Company, at Bellefontaine, Ohio, has just finished a 50 x 60 ft. addition to its works. The capacity of the plant at present is about 3,000 tons, an increase of 500 tons in two years.

The Joliet Bridge & Iron Company has increased the capacity of its plant 50 per cent. in two years, and now has a capacity of 5,000 tons per annum. The company

has under consideration some improvements that will increase the capacity, but nothing definite has been decided. The company has of late installed electric power for its entire plant. Its present business consists in making highway bridges and structural work, mostly factory buildings, public buildings, street car barns and the smaller class of railroad bridges.

At Elkhart, Indiana, the machinery of the new plant of the Elkhart Bridge Company was started on March 17, and it is expected to have the full plant in operation within a few days. The plant covers four acres. The machinery is all driven by electric motors. F. W. Fahlgren is the General Superintendent.

Another Indiana company that has increased its capacity 50 per cent. in two years is the Attica Bridge Company. The company has just finished improvements at a cost of $7,000.

In the northwest, where more steel highway bridges are being built than formerly, the bridge plants have also been enlarged quite materially in the past two years. The Wisconsin Bridge & Iron Company at North Milwaukee has increased its capacity 40 per cent. in that period; the works now having an annual capacity of 15,000 tons.

The plant of the American Bridge Company at Milwaukee, formerly the Gillette-Herzog Mfg. Co., is to be greatly enlarged, probably doubling the present capacity.

The Modern Steel Structural Company at Waukesha, Wis., is a new concern, and has a plant that will turn out 500 tons a month. The only improvement made at the works since the completion was the addition of a small power house.

The Groton Bridge Company, at Groton, N. Y., is also a new company just starting in business. It is now erecting shops which, when completed, will have a capacity of about 2,000 tons per month, but it will be some months before it will be able to do any great amount of business.

The capacity of the bridge works of the Passaic Rolling Mill Company at Paterson, N. J., is about 12,000 tons per annum. In the last two years the works have been modernized by improved arrangement and addition of new tools and some extensions to buildings. Some quite extensive additions are proposed, but the plans are not yet fully decided upon.

The Phœnix Bridge Company, at Phœnixville, Pa., whose works were started in 1790, at which time they consisted of a rolling mill and nail factory, is now the largest concern outside the American Bridge Company, making its own steel and all parts which go to make a complete bridge. The latest improvements to the Phœnix Bridge works, that is, 1898 up to date, consist of four new 40-ton open-hearth furnaces and two four-hole soaking pits for the steel department and additional gas producers and boilers; the open-hearth department being equipped with electric charging machines and with electric traveling cranes for charging and drawing ingots in blooming mill.

The beam mill has been entirely remodeled, the equipment consisting of two heating furnaces with capacity of 35-tons each of blooms, the blooms being charged into and drawn from the furnaces with a Wellman-Seaver charging and drawing machine, in connection with transfer car, which are all electricaly driven. The rolls are driven by a pair of Mackintosh, Hemphill & Co.'s reversing engine, 28 in. x 48 in. cylinders. All the material is handled at the rolls by a pair of Wellman-Seaver electrically driven tables, it being one of the most complete mills of its kind in the United States. The product of all the mills is loaded directly on cars from the cooling pits by electric overhead traveling cranes.

In the bridge shop, electric cranes have been installed and heavier machinery added, a number of machines being driven by individual electric motors. These improvements have doubled the capacity of the works until at present they are turning out 150,000 tons a year. The hydraulic department of the Phœnix Bridge Co. is capable of forging the largest eye-bars ever made, one of which was illustrated Jan. 31, p. 73. The testing machine of the Phœnix Bridge Co. is the largest in the world, 2,000,000 lbs. capacity both for tension and compression.

Of the recent reports of contemplated bridge plants, one says that the Penn Bridge Company at Beaver Falls, Pa., is considering increasing its capital to make extensive additions to its plant, but the company tells us that it is not ready to give out information. Another report is that the LaBelle Iron Works, of Steubenville, Ohio, will extend its Wheeling, W. Va., plant and make structural steel.

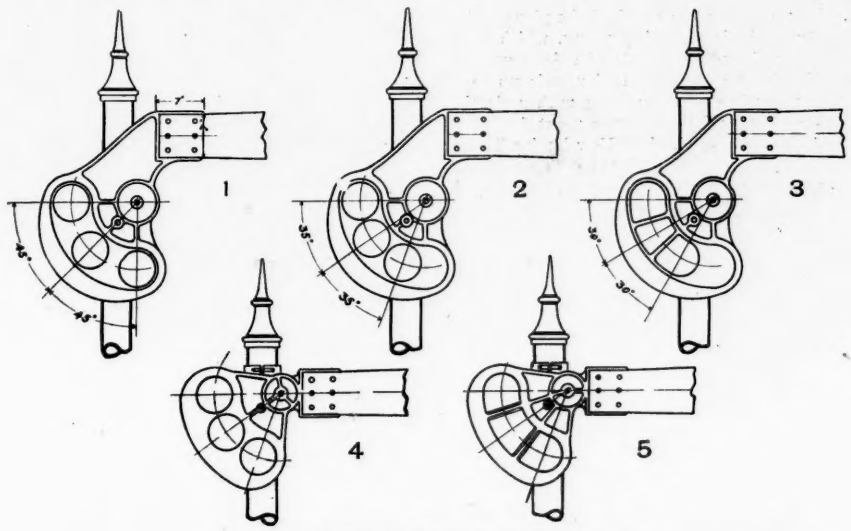
Signaling and Interlocking.*

How to effect a saving is a problem always to be solved, but it frequently happens that the solution does not depend upon individual effort. This is the case as it stands to-day with regard to the adoption of standard designs at joint interlocking plants. There must be an organized effort on the part of all the roads concerned if anything of importance is to be accomplished. With this idea, the Committee has made an effort to get an expression of opinion from 43 railroads by sending to each a set of six prints selected from the drawings prepared relating to the appliances involved at these plants. The railroads were asked to send prints of their own standards covering the same and to make suggestions and recommendations on those sent them. These plans were sent out during February, too short a time before this meeting to get enough answers for us to report upon, but the few we have received lead us to believe that the idea will receive general endorsement and that the answers will enable us to come before you next year with plans and specifications in proper shape to recommend to the Association for adoption. Power-plant systems, automatic block systems, electric locking, and the question of a time release as a substitute, are live subjects, and a study of which equipment is best suited for certain arrangement of tracks and switches and traffic conditions will be made and reported upon.

On the subject of standard designs and specifications for interlocking plants, the Association's opinion was asked at the last meeting about the desirability and practicability of adopting a single type of fixed signal for all interlocking and block purposes. We present the question again for consideration. In respect to its desirability we have this to say: Over one hundred designs of semaphore castings are now on the market and in use, many of which are bad and do not embody correct principles. The good ones differ in unimportant details. We demonstrate the practicability of a standard design in the attached sketch. It has been customary to consider a different design necessary for different degrees of travel of the signal arm and light casting. Figs. 1, 2 and 3 illustrate a form of casting adapted to the three-position signal, and the two-position signal with 90 deg., 70 deg. or 60 deg. travel, the only difference being that a separate spectacle is required for each. The castings are shown mounted on side bearings, but they are equally well adapted to the center bearing. The only change required is the lamp bracket.

Fig. 1 is the only one that does not show the continuous light principle; but this can easily be included by use of glasses shaped as shown at Fig. 3. Fig. 4 shows the same type as Fig. 5, but with round glasses. If any road prefers to carry less glass in the semaphore casting, the center light may be made blank. All are designed to take a green glass, should that color be adopted for the clear indication.

This report is signed by J. C. Mock, Michigan Central; J. W. Thomas, Jr., N. C. & St. L.; T. S. Stevens, Santa Fe, and A. H. Rudd, Lackawanna.



Proposed Standard Semaphore Castings.

DISCUSSION.

Mr. J. C. Mock (M. C.): The committee held but one meeting, the chairmanship coming to me at a late date, and it would be hardly possible to make a report that would be satisfactory or to make recommendations which we would want the committee to take final action on. We would like to have an expression from the Association as to whether they would recommend or adopt the continuous light principle. This matter has been before the Association for two years and we find that the manufacturers are not giving the attention to the continuous light principle that we believe the matter deserves.

President Kittredge: This committee has been most unfortunate. It has had during the year some three or four different chairmen, and the last resignation came so late that it was impossible for the present committee to make more than a start.

Mr. Wendt: The Chairman of the committee asks that the Association express its views with regard to the continuous light principle. It would be well to have that submitted to the members of the Association by ballot during the year, as undoubtedly most of the members in attendance upon the convention are not prepared to vote on the question. (Moved and seconded).

Mr. H. D. Miles (M. C.): Do they also care to have the Association consider the question of the position of the arm signals? That point, as well as the question of continuous light, affects the design of the signal arm casting. In considering one both should be considered. I question whether the committee will get much benefit from that unless they send out drawings with the request for letter ballot. The committee previously had considerable trouble in getting any expression of opinion. The members of the Association are not, many of them, very familiar with signaling, and that was one of the drawbacks in considering the subject.

Mr. Wendt accepted an amendment that the committee be instructed to prepare and submit the question of the position of the arms, and of continuous light.

Mr. Cushing: When the committee sends out questions with regard to the position of arms it is well to present it by diagrams. As to the continuous light principle I think it would be well to have the chairman of the committee elaborate a little on what the committee considers its advantages. We who have not used it do not see any, but are open to conviction.

Mr. J. C. Mock: The continuous light principle seems to have advantage because many signals are used as semi-automatic, and in times of snow and sleet the arm is liable to droop sufficiently to show a white light, so that any slight derangement from the horizontal position gives you a white light. The hiding of the light seems to give no information and is about as dangerous a condition as having no signal. The continuous light is intended to show a danger condition until the signal is entirely clear. The chances are that the signal will not remain in that extreme position if any derangement occurs. It may get in the middle position or go to "Danger." The designs are all intended to have it go to danger, but there are many things that might conflict with that, as a broken wire, which will allow the signal to go partially to "Danger," but it meets an obstruction and holds it in a middle position. In that case you get a danger indication, which you should get, whereas if you didn't have continuous light, you would either get no light or a white light.

Mr. Cushing: The continuous light principle is not necessary to cure the difficulty. It has been cured by the addition of a small shield as a continuation of the casting. The continuous light plan, as proposed, necessitates the use of extra glass, which is subject to being broken.

*Extracts from the Report of the Committee of the American Railway Engineering and Maintenance of Way Association, March, 1902.

Dr. Lardner and Trans-Atlantic Steaming.

Everybody who has had much to do with inventors has, time and again, been confronted with the story that Dr. Lardner proved conclusively that it was a physical impossibility for a steamship to cross the Atlantic Ocean. We have long doubted the fact and generally failed to see the analogy, and an investigation of Dr. Lardner's works shows that he never attempted to demonstrate any such proposition. In fact, in a public lecture given in the United States he denied ever having made a statement to that effect.

The story originated in 1837, at which time Dr. Lardner delivered an address before the meeting of the British Association in Bristol on the Atlantic steam question. Two projects had been started, one advocating the establishment of a line of steamers between the west coast of Ireland and Boston, touching at Halifax, and the other a direct line between Bristol and New York. Dr. Lardner strongly urged the advantage of the former line and, by comparison, deprecated the project of the direct line. The rumor immediately spread all over the world that Dr. Lardner had pronounced the Atlantic steam voyage impractical. He was quoted as saying that it was a mechanical impossibility, that the project was chimerical and that we might as well attempt to steam to the moon as to New York. There was probably no man in England who was better informed on the steamship question than Dr. Lardner, and such a statement from him at this time appears absurd on the face of it. Besides, the steamer "Savannah" had crossed the Atlantic from Savannah to Liverpool as early as 1819, nearly 20 years before the story originated.

Dr. Lardner did make some statements in the nature of predictions at this meeting which are all the more interesting because they were confirmed to the letter during the years that followed. His proposition was that the successful establishment of a permanent and regular line of steamers running throughout the year from Bristol to New York was extremely doubtful in the state in which the art of steam navigation then was, for the simple reason that such a line would not be a profitable financial investment. On the other hand the route from

the west coast of Ireland to Boston via Halifax would not only require a shorter continuous passage, but would also enable the company operating it to get possession of the British post office contract for carrying the mails. The limit imposed by Dr. Lardner, therefore, was one of expense and not of mechanical possibility or impossibility.

The attempt was made in the following year to establish a permanent line of steamers from Bristol to New York, but the service was very irregular and involved such a large financial loss to the promoters that it was finally abandoned. A really permanent service was not established until many years had passed and then only after great improvements had been made in steamships. The line to Boston via Halifax was established in 1840 and was fairly successful from the start.

When the "Sirius" and "Great Western" steamed into the harbor of New York on that memorable day in 1838 Dr. Lardner came in for a good deal of undeserved criticism and ridicule from those members of the New York community who were collecting their bets and venting their "I told you sos." The story itself is such a good one that it will no doubt go the rounds for many years to come in spite of all that Dr. Lardner and his publishers have done to set the matter right. C. T.

Dr. Lardner in "The Steam Engine," 1836 (pages 264-267), says that "to form an approximate estimate of the limit of the present powers of steam navigation, it will be necessary to consider the mutual relation of the capacity or tonnage of the vessel, the . . . power of the machinery, the available stowage for fuel, the average speed, etc." He then gives an account of the voyages of a number of steamers, showing the capacity, power, rate of speed, etc., of these vessels and draws the following conclusion:

"We shall, therefore, perhaps be warranted in assuming that it is practicable to construct a steamer capable of taking 1½ tons of fuel per horse-power. At the rate of consumption just mentioned, this would be sufficient to carry her 2,400 miles in average weather; but as an allowance for fuel must always be made for emergencies, we cannot suppose it possible for her to encounter this extreme run. Allowing, then, spare fuel to the extent of a quarter of a ton per horse-power, we should have as an extreme limit of a steamer's practicable voyage without receiving a relay of coals, a run of about 2,000 miles."

In regard to a steamship line across the ocean Dr. Lardner goes on to say in this same work (pages 274-276): "Another projected line of steam communication . . . is that between London and New York. . . . The nearest point of the western continent is St. John's Newfoundland, the distance of which from Valentiá, Ireland, is 1,900 miles, Halifax being a convenient intermediate station. The distance from Valentia to St. John's comes very near the point which we have already assigned as a probable limit of steam navigation. The Atlantic Ocean also offers a formidable opponent in the westerly winds which almost constantly prevail in it. . . . Besides this difficulty, St. John's and Halifax are both inaccessible, by reason of the climate, during certain months of the year. . . . Another course may be adopted . . . from the southern point of Ireland or England to the Azores, a distance of about 1,800 miles; from the Azores to New York would be a distance of about 2,000 miles; or from the Azores to St. John's would be 1,600 miles."

TECHNICAL.

Manufacturing and Business.

The Boston Bridge Works has removed its office from 70 Kilby street to 47 Winter street, Boston, to larger quarters.

The address of the Pittsburgh office of the Niles-Bement-Pond Co. is now Frick Building instead of Carnegie Building, as heretofore.

W. G. Pearce, whose resignation as General Manager of the Northern Pacific was announced last week, will, it is said, become Vice-President and General Manager of the Griffin Wheel Co., New York and Chicago.

The Union Construction & Contracting Co. has applied for a charter in Maryland to build bridges, canals, sewage systems, railroads, etc. Among those interested are Arthur Pue, T. Leigh Marriot and Benj. J. Green, of Baltimore.

The Havana Bridge Works at Montour Falls, N. Y., which, as recently reported, has sold its bridge works to the Rochester Bridge & Construction Co., will hereafter make pneumatic tools under the management of J. A. Shepard, Vice-President.

The plant of the Bass Foundry & Machine Co. at Fort Wayne, Ind., was never busier than now. Large and small stationary engines, large and small boilers and great numbers of car wheels and foundry castings generally are being turned out. The company cannot promise delivery on large engines under eight months.

The sixty thousand mark has been passed by the Pressed Steel Car Company in pressed steel cars. The company's output up to March 27, 1902, aggregated over 60,000 finished cars, or sufficient to make a solid train of cars 360 miles long. The works are delivering over 100 finished cars a day, in addition to trucks, bolsters, center plates and other pressed steel specialties for wooden and steel cars.

The Sherwin-Williams Co., paint and varnish maker, has recently doubled its capacity at Chicago, equipping the plant throughout with new machinery. A warehouse has also been built at Minneapolis, Minn., for the accommodation of its northwestern business. With these improvements the company will be better prepared to handle its large and growing railroad business in the west and northwest.

Vice-President Overstreet, of the Climax Stock Guard Co., Chicago and Canton, Ohio, reports recent aggregate sales of 1,000 of its guards. The purchasers were steam and electric roads. The company has been reorganized and new life has been injected into its affairs. H. B. Stewart, Canton, Ohio, is President, and H. E. Overstreet, Fisher building, Chicago, Vice-President and General Manager.

According to a despatch from Birmingham, Ala., it is announced that E. O. Hopkins, President of the Sloss Sheffield Steel & Iron Co., has resigned, his resignation being effective May 1. It is also said that J. J. Gray, in charge of the company's property in the Sheffield District, and C. T. Culberhouse, Mining Superintendent, have resigned. J. C. Maben, it is further announced, will succeed Mr. Hopkins.

Geo. J. Cadwell, well-known in electric matters in the East and Middle West, is now in charge of the Philadelphia branch (Stephen Girard Building) of Pawling & Harnischfeger, Milwaukee, Wis., makers of electric traveling cranes and traveling electric hoists. He will also supervise the New York branch, with offices in the Bowling Green Building. Mr. Cadwell was some seven years with the General Electric Co., and a shorter time with the Christensen Engineering Co.

Perth Amboy Shipbuilding & Engineering Co., Perth Amboy, N. J., has opened its plant for a general shipbuilding business, including the building and repairing of steel and iron vessels of all descriptions; the manufacture of marine engines, gasolene and kerosene engines, marine and stationary boilers, both water tube and cylindrical, and the building and installation of all classes of machinery. The company has acquired the plant and adjoining property of the late Hugh Ramsay, which is well located and equipped and is capable of enlargement sufficient to admit of the construction of vessels up to 750 ft. long. The plant has a water front with a depth of 40 ft. of water. Under former management 117 vessels were launched from this yard. The New York office is at 11 Broadway.

The American Brake Shoe & Foundry Company, with temporary offices at 26 Cortlandt street, New York City, has issued a circular announcing that it has assumed control of the brake-shoe output of the plants at which the following well-known types of brake-shoes are made: The Sargent Skeleton Steel, the Diamond "S," the Skeleton Steel Insert, the Lappin Steel Back, the Streeter Steel Back, the Corning, the Ross-Meehan, as well as other types of brake-shoes for various classes of both steam and street railroad service. Hereafter the agents of the constituent companies will represent the combined interests; until further notice, however, orders will be sent direct to the several companies as heretofore. The circular is signed by W. W. Snow, President, Ramapo Foundry Company, Mahwah, N. J.; W. D. Sargent, President, Sargent Company, Chicago, Ill.; Joseph D. Gallagher, President, Lappin Brake Shoe Company, Bloomfield, N. J.; J. B. Terbell, President, Corning Brake Shoe Company, Corning, N. Y., and Frank L. Gordon, Vice-President, Streeter Brake Shoe Company, Chicago, Ill.

Iron and Steel.

Henry Konitzky has been appointed Superintendent of the Baltimore Dry Dock Company, succeeding Wm. T. Fitzgerald, resigned.

The Chattanooga Bridge Co., of Hamilton County, Tenn., has been incorporated in that State by Wm. M. Hewitt, C. E. Stewart, W. O. Burks and A. R. McKenzie.

The Bush Engine Co. has filed articles of incorporation at the County Clerk's office in Newark, N. J., with an authorized capital of $5,000,000. The company proposes to make boilers, engines, car wheels, trucks, automobiles, etc. James B. Dill, 29 Pine street, New York City, is interested.

The independent sheet steel makers have taken a step toward covering their shortage in billets. Three of the companies, namely, the Whitaker Iron Co., the Laughlin Nail Co., and the Maryland Steel Co., of which A. F. Baumgarten, of Pittsburgh, is President, have jointly bought the Burgess Steel Company's plant in Portsmouth, Ohio, from the Crucible Steel Co. of America. The new owners will add two additional open-hearth furnaces, after which it is expected to have a daily output of 500 tons of billets.

The directors of the United States Steel Corporation at a meeting April 1 ratified the plan of the Finance Committee for a new issue of bonds, to retire part of the preferred stock and to provide additional capital. Details of the bond issue were withheld, but a special meeting of the stockholders was called for May 19 to act on the proposition. Under the conversion plan it is proposed to retire preferred stock to the amount of $200,000,000 upon which dividends are paid at the rate of 7 per cent. per annum and issue bonds to a total of $250,000,000 with interest at 5 per cent. The statement of earnings for the full year (the returns for March being estimated) given out showed a total of over $111,000,000. Mr. Gary, Chairman of the Board, stated that the extra $50,000,000 of bonds above the $200,000,000 to be used for retirement of preferred stock would give a working capital of about $106,000,000 to be used in any way that the directors might deem best. It is not said that this implied the acquisition of any new plants. No action was taken in regard to electing a successor to Percival Roberts, who resigned as a member of the Executive Committee some time ago. The regular dividends of 1¾ per cent. on the preferred stock and of 1 per cent. on the common stock were declared.

De Glehn Freight Locomotives.

The Midi Railroad of France has just had delivered two large consolidation compounds on the De Glehn system for freight work. These engines are somewhat of a novelty in Europe since the generality of eight coupled engines have not had any pony truck in front. The grades on the system are very severe in places since they are as much as 158 ft. to the mile.

Pintsch Gas on the Atchison.

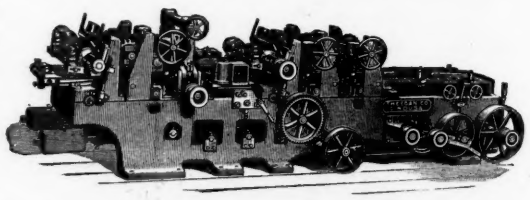
Since the first of the year the Atchison, Topeka & Santa Fe has ordered Pintsch lighting equipment for 83 cars. The total cars now gas-lighted on the road aggregates 157. The Pintsch Compressing Co. is about to build a Pintsch gas works for the Atchison at Point Richmond, Cal: This plant is ordered and paid for by the road; the Safety Company building and equipping it as contractors. A Pintsch supply station will be established at Barstow, Cal., while a Pintsch gas works has just been completed at El Paso, Tex., where the Atchison cars on that division will be supplied.

The Pennsylvania Avenue Subway.

The March issue of the *Proceedings* of the American Society of Civil Engineers contains an admirable paper on the Pennsylvania Avenue Subway and Tunnel at Philadelphia. This is by Geo. S. Webster and S. T. Webster, Members of the Society. The paper follows one by the same writers which appeared in an earlier issue of the *Transactions*. The description is very thorough with numerous illustrations and fills nearly 80 pages of the *Proceedings*.

A Double-Cylinder Floorer.

This machine, the No. 15 lightning floorer, was patented March 20, 1900, and is designed for making flooring, ceiling, siding, casing, etc., in large quanities. It planes



four sides 9 and 14 in. wide and 6 in. thick and, by the use of belt-tightening apparatus, 1½-in. stock can be matched. The frame is massive, preventing vibration, and resists all strain, and the machine can be run at very high speed if desired. The feed is six large rolls having expansion gearing. They can be easily raised and lowered, and the feeding-out roll is provided with scrapers. The matching works are very heavy, the cylinders four-sided and slotted, and shaving hoods swing outward to give access to knives. The pressure-bars have easy and quick adjustments, and many improvements. The makers, J. A. Fay & Egan Co., Cincinnati, will furnish any further details, cuts and prices, together with their new catalogue.

A Four-Cylinder Compound Canard.

A newspaper paragraph has been going the rounds saying that no more compound locomotives of any type would be ordered for the Paris, Lyons & Mediterranean Railway; that the four-cylinder compounds had failed to show any benefit, and that only simple engines were now being contracted for. Mr. P. W. Baudry, Chief Engineer of Motive Power of the Paris, Lyons & Mediterranean, informs us that the foregoing statement is totally incorrect, as outlined; that the four-cylinder compounds are eminently satisfactory, and that he has no intention of adopting any new type at present.

Prize Designs for Fast Train Equipment.

The German Society of Mechanical Engineers offers 10,000 marks in prizes for designs for rolling-stock for a train to be hauled by steam locomotives at the highest practicable speed. The locomotive must be capable of hauling a train weighing 200 tons over a straight and level road at a speed of 120 km. (74½ miles) an hour for three hours without stopping, the highest permissible speed being 93 miles an hour. The designs for cars must provide for ventilation, heating and lighting, and special attention must be given to securing a steady motion and security to the passengers in case of accident. The train must have seats for 100 passengers and place for their baggage, and some provision for refreshments on the way. Effective brakes must be provided. Only German citizens and German locomotive and car works may compete. Designs must be offered by Dec. 1 next.

The American Society Committee on the Rail Section.

The committee of the American Society of Civil Engineers to take into consideration the desirability of modifying the Society's standard rail sections (and to do several other things) was announced at the meeting of the Society held on Wednesday evening. This committee is appointed by the Board of Direction. It is as follows: L. F. G. Bouscaren, Consulting Engineer, Cincinnati, Ohio, Chairman; C. W. Buchholz, Chief Engineer, Erie Railroad, New York City; S. M. Felton, President, Chicago & Alton Ry., Chicago, Ill.; Robt. W. Hunt, Consult-

ing and Inspecting Engineer, Chicago, Ill.; J. D. Isaacs, Assistant Engineer of Maintenance of Way, Southern Pacific Co., San Francisco, Cal.; Richard Montfort, Chief Engineer, Louisville & Nashville R. R., Louisville, Ky.; H. G. Prout, editor *Railroad Gazette*, New York City; J. T. Richards, Engineer Maintenance of Way, Pennsylvania R. R., Philadelphia, Pa.; Percival Roberts, Jr., American Bridge Co., New York City; G. E. Thackeray, Structural Engineer, Cambria Steel Co., Johnstown, Pa.; E. K. Turner, Consulting Engineer, Boston, Mass.; Wm. R. Webster, Consulting and Inspecting Engineer, Philadelphia, Pa.

The Barschall Joint.

In the March issue of *Traction and Transmission* is an elaborate account of the Metropolitan Railway in Vienna. Among other details, we find a cross section of the Barschall joint, which is standard there and "has proved to be most satisfactory in Vienna. It carries the wheels smoothly and noiselessly over the joints, prevents hammering, and therefore prolongs not only the life of the rails, but also that of the whole superstructure."

A New Wood Preserving Plant.

The International Creosoting & Construction Co., of Galveston, Texas, has begun work on another wood preserving plant at Texarkana which will be operated in connection with its Beaumont plant. The main building will be 210 x 105 ft., equipped with two cylinders 9½ ft. in diameter and 165 ft. long; one cylinder 6 ft. x 125 ft.; four elevated working tanks with 100,000 gal. capacity; one underground tank 40 ft. in diameter x 20 ft. deep; two 250 h.p. boilers. The plant will be lighted by an 80-arc light dynamo. The company will also have complete machine and blacksmith shops.

New Dry Dock Plans.

The Bureau of Yards and Docks, Navy Department, is preparing plans for two stone dry docks, one to be at New York Navy Yard and the other at Norfolk Navy Yard, and to cost about $1,000,000 each. These docks will be similar in design to the stone docks to be built at Boston and Portsmouth Navy Yards, and with other docks already built will give ample docking facilities for the Navy for years to come.

THE SCRAP HEAP.

Traffic Notes.

The Railroad Commissioners of Texas have brought suit against the Gulf, Colorado & Santa Fe for making unlawful rebates on lumber. It appears that the railroad had made through joint rates with a private logging railroad, which is not a common carrier, and is not recognized by the commissioners.

Passenger Traffic Manager Wrenn, of the Plant System, says that Florida tourist traffic during the past winter broke all records, an average of 55 sleepers having been hauled daily in either direction over his lines. He thinks that at the close of the season there were not less than 30,000 or 40,000 tourists in Florida.

The Interstate Commerce Commission, in an opinion by Commissioner Clements, has announced its decision in the case of the Mayor and Council of Tifton, Ga., against the Louisville & Nashville, the Georgia Southern & Florida, the Plant System and others, in favor of the complainant. The Commission decides that freight rates from New York and other Eastern cities which are higher to Tifton than to Albany, a longer distance point over the same line, are unlawful; that freight rates from Cincinnati, Louisville, Evansville, Nashville and other Ohio River points which are higher to Tifton than to Valdosta, a longer distance point over the same line, are unlawful; that the rates now charged on sugar from New Orleans to Tifton are unjust and unduly prejudicial to Tifton, and such rates should not exceed rates on that commodity from New Orleans to Valdosta.

The traffic managers of railroads in the territory between New York and Chicago and St. Louis and of the steamship lines plying on the Great Lakes are said to have reached an agreement on flour and grain freight rates to the Atlantic seaboard for the ensuing summer. At a meeting in Buffalo March 28 the following resolution was adopted: Commencing April 14 next, the rates for flour and grain from Chicago to New York either for export or for domestic use are to be on a basis of 17½ cents per 100 lbs. all-rail; lake and rail, 15½ cents. In other words, the lake and rail differential will be 2 cents instead of 3 cents, as last year. The all-rail lines agree to make no rate at less than 17½ cents. The agreement further provides that the differential via Montreal and Quebec, lake and rail, is to be 2½ cents. In order to insure adherence to these rates it is proposed that all the lines agree to exchange statistics of their flour and grain traffic. The agreement is to hold good until June 15 absolutely, and a change may be made after that date only by a conference of all the lines held after due notice. Last year the published rates were 15 cents all-rail and 12 cents lake and rail; but much of the time the all-rail routes disregarded the differential granted to the lake and rail lines, and took all the business they could get.

Another Rate Inquiry at Chicago.

At Chicago April 1, the Interstate Commerce Commission examined the traffic managers and general freight agents of the Rock Island, the Santa Fe, the Milwaukee, the Alton, the Burlington, the Missouri Pacific, the Wabash, and the Chicago Great Western as regards their knowledge of cut rates on export traffic from the Missouri River to the Atlantic seaboard.

Commissioner Prouty conducted the examination. It appeared that few of the roads published their export tariffs, and that if they did publish them they paid little attention to the published rates. Some of the officials took the position that they were not compelled under the law to publish export tariffs, because they had to make the rates in conjunction with the ocean rates and the latter fluctuated from day to day. Commissioner Prouty, however, thought export rates must be published the same as domestic, and each road in turn was requested to file export tariffs hereafter.

It appeared during the investigation that the Rock Island filed a tariff on packing house products, to be in effect from Feb. 15 to March 15, from Missouri River points to New York, of 42½ cents per 100 lbs., while the rate filed by the other roads was 48½ cents, and as most of the latter managed to get a full share of the business, the Commissioners surmised that the rates had been cut by these roads. This, however, was denied by all of the witnesses.

Assistant Traffic Manager Gower testified that the Rock Island reduction in rate was made because it could not get any business at Kansas City at the 48½ cent rate. The testimony of the officials of the other roads was that they faithfully maintained the 48½-cent rate, and refused to take any notice of the Rock Island's action. Each road submitted to the commission a statement showing export and domestic shipments and what rates were made on them from Feb. 15 to March 15, 1902.

South Carolina Laws.

The Legislature of South Carolina, which has recently adjourned, passed four acts which are of interest to railroad companies.

No. 92 prescribes the measure of damage to which a carrier shall be liable when it converts freight, in course of transportation, to its own use. The carrier shall be liable for the value of the goods and for punitive damages not exceeding three times the value of the goods.

No. 136 requires all railroads to provide spittoons in all passenger cars, at least one for every two seats; penalty for non-compliance $25 for each offense.

No. 95 requires railroad companies of other States to become incorporated under the laws of South Carolina, at least one of the petitioners being required to be a resident of that State. The companies now operating in the State must organize under this law by June 1st. Sections 4 and 5 provide for the payment of fees and prescribe penalties for non-compliance. The law does not apply to corporations which have become domesticated under existing laws.

No. 86 requires electric street railway companies to have vestibules on their cars, for the protection of motormen, during the four winter months; penalty for non-compliance $10 a day. This law does not apply to Charleston County.

The Department of Commerce.

During last week hearings were given before the Committee on Interstate and Foreign Commerce of the House of Representatives on the various bills to establish a Department of Commerce, one of which, known as the Nelson bill, has already passed the United States Senate. There is opposition from the labor organizations, which do not want the Bureau of Labor included in the proposed Department as is provided in the Nelson bill. The hearings will be continued.

Floods North and South.

Many miles of railroad in Tennessee and Mississippi were made impassable by floods on March 26 and 27. On the Yazoo & Mississippi Valley, south of Port Gibson, about six miles of track was reported washed away. A passenger train was derailed at a washout near Lorman, Miss. On the main line of the Nashville, Chattanooga & St. Louis, between Cortner and Wartrace, the Duck River bridge, the Little Garrison bridge, and several miles of track were washed away. From Iron City it was reported that many railroad bridges and trestles had been washed away. A Pulaski report said that out of 35 iron bridges in the county only five remained. A 100 ft. bridge of the Nashville & Knoxville, at Lancaster, Tenn., was carried away by the flood.

On March 28 the Northern Pacific was blockaded by floods in North Dakota. Near McKenzie boats and rafts had to be used to transfer passengers across Apple Creek, ordinarily a very small stream. In Montana a landslide was reported half a mile long. Press despatches of April 1 reported traffic still completely blocked in North Dakota. Between Havre and Williston on the Great Northern "the whole country was flooded." No trains had arrived in Butte from the East for several days. Traffic on the Northern Pacific was at a standstill.

The River and Harbor Bill.

The House of Representatives began consideration of the River and Harbor bill on March 17, and after five days' discussion passed the bill on March 21. The amount carried by the bill as passed is exactly as reported—$60,688,267, including continuing contracts, and only minor amendments were adopted. Further details regarding the bill will be given when it passes the United States Senate.

Railroad Concession in Central America.

Consul-General Jenkins of San Salvador reports under date of Feb. 16 that a concession has been granted to Jose Cabezas Bonilla of Costa Rica for the completion of the railroad from the Port of La Union to San Miguel in Salvador, and also for a line from San Miguel to San Salvador, making a total of 100 miles. A steel pier is also to be built at La Union. It is required that work be begun within five months after the contract is declared legal, and must be completed in 15 months after it is begun. The heaviest grade is not to exceed 3½ per cent., and least radius of curvature is to be 85 meters. In time of war, transportation of troops and supplies of war shall be free, and at all times transportation of military on duty. The company shall be absolute owner and possessor of the railroad for 75 years, at the end of which time the railroad, with all its property and business, shall become the property of the Nation. It is agreed that during the time of this concession no other railroad shall be built from La Union to San Salvador.

The Mersey Tunnel Railroad.

The Mersey Railway Co. reports that the British Westinghouse Co. has the electrical works in course of construction for their tunnel railroad, and substantial progress has already been made.

The London-Brighton Electric Road.

The London to Brighton electric express railroad has been stopped for this year, the Parliamentary committee having thrown out the bill as not complying with the standing orders. It is practically certain that the measure will come up in much the same form next year, although in the meantime the plans of the L. B. & S. C. Railway to build a tunnel from London to Croydon, and run electric trains therein, so as to relieve the lines into the city will no doubt make considerable headway.

Electric Railroads in England.

Consul McFarland reports from Nottingham under date of Feb. 25 that the electric railroad projects in Nottinghamshire and Derbyshire have met with the opposition of the established steam lines, with the result that the plans have been for the time withdrawn and the promoters have submitted the matter to Parliament.

German Railroad Men and the Eating Houses.

The keepers of station eating houses in Germany have a union which numbers about 1,500 members, which indicates that opportunities for refreshment are more numerous there than here. As these eating houses are also drinking houses, it is not so strange that so many people can make a living out of them. This union held a convention recently at which the most exciting subject seems to have been the amount of the discount which the landlords are required by their contracts to make to the railroad employees who patronize them, discounts which the railroad authorities seem inclined to increase. On one railroad they are required to give employees for 18 pfennige 0.4 of a litre of genuine beer, which, being interpreted, is 4.3 cents for a measure holding about as much as the ordinary bottle of beer known here—we would say a "schooner" if we thought that term would be intelligible to our readers. For a glass of "warm beer" (whatever that may be; something awful, doubtless) the eating house may charge the railroad man but 10 pfennige. To add injury to insult, the railroads charge rentals in proportion to gross receipts, and so if the landlords do a big business with the men at cost or less their rents are raised.

Notwithstanding which it appears (but not from the proceedings of this convention) that when privileges at important stations are let to the highest bidder enormous prices are given for them.

LOCOMOTIVE BUILDING.

The Georgia R. R. is having one locomotive built at the Baldwin Works.

The Oahu (Hawaii) Ry. & Land Co. is having two locomotives built at the Baldwin Works.

The Texas & Pacific is having 10 locomotives built at the Cooke Works of the American Locomotive Co.

Harry Park, Ashland, Wis., has bought a second-hand 50-ton geared logging engine from the Hicks Locomotive & Car Co.

The Bowman-Hicks Lumber Co., of Loring, La., has ordered a 15 x 22 (rebuilt) locomotive from the Hicks Locomotive & Car Works.

The Cleveland, Cincinnati, Chicago & St. Louis is having 10 locomotives built at the Dickson Works of the American Locomotive Co.

The Kirby Lumber Co., of Beaumont, Texas, has ordered in addition to three previously, a fourth six-wheel locomotive (rebuilt) from the Hicks Locomotive Works.

The Canadian Pacific has ordered 72 locomotives, 40 of which will be built by the Schenectady Works of the American Locomotive Co., eight, consolidations, by the Canadian Locomotive Co., of Kingston, Ont., and the balance at the company's own shops.

The Baldwin Locomotive Works are shipping this week 12 locomotives for the Government of Western Australia. They are 10-wheeled, with cylinders 16½ x 22, total weight 84,570 lbs., weight on drivers 61,570 lbs., diameter of driving wheels 49 in., tender, 8-wheeled, of 3,000 gal. capacity.

CAR BUILDING.

The Elgin, Joliet & Eastern is having a coach built at the Pullman Works.

The Lexington & Eastern has ordered 100 coal cars from the American Car & Foundry Co.

The American Car & Foundry Co. is building 18 cars of miscellaneous types for different parties.

W. E. Brice is having 100 freight cars built by the American Car & Foundry Co. at Milton, Pa.

The Cuba Co. is having 200 freight cars built by the American Car & Foundry Co. at Berwick, Pa.

The General Chemical Co. is having 25 freights built at the Milton Works of the American Car & Foundry Co.

The Mexican Ry. has ordered from the Allison Mfg. Co., Philadelphia, about 50 8-wheeled coal cars of a new type.

The Southern Pacific has ordered about 250 tank cars of 10,500 gal. capacity from the Allison Mfg. Co., Philadelphia.

The Glenfield & Western has ordered from the Hicks Locomotive & Car Works six (rebuilt) flat cars, 36 ft. long and of 50,000 lbs. capacity.

The Bellingham Bay & Eastern has purchased from the Hicks Locomotive & Car Works 10 (rebuilt) flat cars, 36 ft. long and of 60,000 lbs. capacity.

The Chesapeake & Ohio has ordered 150 hoppers, 100 flat cars and five combination passenger, mail and baggage cars from the American Car & Foundry Co.

The Des Moines, Iowa Falls & Northern is having two coaches built at the Wilmington plant of the American Car & Foundry Co. E. S. Ellsworth, of Iowa Falls, is President.

The Grand Trunk is building at its London shops 300 flat cars of 60,000 lbs. capacity. These cars will be 36 ft. 9¾ in. long, 9 ft. ¾ in. wide and 4 ft. high, and are for July and August delivery.

John R. Lee, railroad contractor, Scranton, Pa., has ordered 10 standard, 40-ft., 80,000 lbs. capacity Rodger ballast cars, equipped with Tower couplers, Westinghouse air-brakes and metal brake-beams.

The Canadian Pacific is building 50 30-ton refrigerator cars of the Bohn System. (See below). These cars will be 37 ft. 9 in. long, 8 ft. wide and 7 ft. 2½ in. high, all inside measurements. The special equipment includes steel axles, Commonsense bolsters, C. P. R. brake-shoes, brasses and dust guards, Westinghouse air-brakes, Tower couplers, Laflare doors, Butler draft rigging, M. C. B. journal boxes and lids, Sherwin-Williams paint, double board roofs, Canadian Switch & Spring Company's springs and C. P. R. standard trucks and wheels.

The Canadian Pacific has ordered the following cars: Two dining cars, 16 combination dining and sleeping for construction department, 40 coaches, 12 sleeping cars, two parlor cars, one observation car, five baggage cars, 55 vans, three pile drivers, two derrick cars, 50 double-deck stock cars, 50 refrigerator cars (see above), 300 coal cars, 218 stock cars, 1,854 box cars and 50 ore cars. In addition to these, 719 flat cars have just been completed. The bulk of this equipment will be built at the company's own shops, except 1,000 40-ton box cars that will be built by Rhodes, Curry & Co., of Amherst, N. S.

BRIDGE BUILDING.

ALLENTOWN, PA.—The Allentown & East Allentown Bridge Co. has accepted plans for the temporary bridge over the Lehigh River at Hamilton street. It will be a trestle 620 ft. long, 24 ft. wide and 25 ft. above low water. It will be built south of the old bridge.

ATLANTA, GA.—The County Commissioners, according

to report, are about to take up the matter of building a new bridge over the Chattahoochee River at Pace's Ferry. E. B. Rosser, Chairman of the Roads and Bridge Committee.

Austin, Texas.—The International & Great Northern, according to report, will build a steel bridge across the Colorado River at Austin, replacing the present structure.

Boston, Mass.—It is said that the plans for the Broadway bridge, which is being rebuilt, have been approved by the Secretary of War.

Bottineau, N. Dak.—Bids are wanted until April 12 by the Board of County Commissioners for building two bridges over the Mouse River. N. P. Nordin, County Auditor.

Brattleboro, Vt.—The Town Committee on Connecticut River Bridge has reported in favor of a steel arch costing $27,000. (March 21, p. 215.)

Bridgeton, N. J.—Bonds are to be sold soon to secure funds for building a $10,000 bridge over the river at Dividing Creek.

Buffalo, N. Y.—The Lehigh Valley, according to report, will widen its bridge at Babcock street.

Canajoharie, N. Y.—Two bills are with the Governor for approval providing for bridges in this town. One will cross the Otsquago Creek.

Charlestown, Md.—Bids are wanted until April 23 at the office of the Queen Anne's County Commissioners in Centerville, for building a draw in the Chester River bridge.

Cincinnati, Ohio.—The Board of Public Service has been petitioned to repair the Liberty street viaduct.

Cohocton, N. Y.—The Town Board is said to be asking bids for a steel bridge over the river near the Erie station.

Columbia, Miss.—A bill has been introduced in the House of Representatives and referred to the Committee on Interstate and Foreign Commerce, authorizing the New Orleans & Mississippi Midland Ry. of Mississippi, to build a railroad bridge across the Pearl River between the towns of Monticello and Columbia, Miss.

Columbus City, Ind.—Bids are wanted April 8 by the Board of County Commissioners for the superstructure of five bridges. Wm. H. Carter, County Auditor.

Columbus, Ohio.—The County Commissioners are considering building a bridge over the Big Four crossing on West Broad street.

Dalton, Mass.—The contract for the steel bridge over the Housatonic has been let to the United Construction Co. of Albany, N. Y., at $6,379. The other bidders were the Berlin Construction Co.; Eastern Bridge & Structural Co.; New England Construction Co., and the Fort Pitt Bridge Works.

Danville, Pa.—The Borough of Danville, we are told, is considering building a bridge. Geo. W. West, Borough Engineer.

Dover, Del.—The Kent County Levy Court has decided to receive plans and specifications for a 40-ft. span bridge over Silver Lake to replace the 20-ft. span built by the Berlin Construction Co., recently washed away.

East Haven, Conn.—The Town Board has voted to permit the Tide Water Trap Rock Co. to build a bridge in place of the present dike at Stony River. The Town Board of Branford has also taken action to permit this bridge. Frank P. Johnson is reported interested.

Ebensburg, Pa.—Bids are wanted April 7 by the County Commissioners for the abutments of a bridge over Stony Creek River near Ferndale. John C. Gates, County Clerk.

Foxholm, N. Dak.—Bids are wanted by the County Commissioners until 2 p.m. April 7, for a bridge at Carpio; also a bridge at Foxholm. Louis A. Larson, Auditor.

Frankfort, Ind.—Bids are wanted April 7 for building two steel bridges and repairing several other bridges. W. H. Armentrout, Chairman County Commissioners.

Franklin, Pa.—The bids received by the County Commissioners on March 27 for building a steel and iron bridge over the Allegheny River at Franklin were received on two plans: (A), concrete floor; (B), wood floor. The bids were: King Bridge Co. (A) $79,000, (B) $72,887; York Bridge Co., (A) $83,000, (B) $76,000; Nelson & Buchanan, (A) $79,581, (B) $73,217; Rochester Bridge & Construction Co., (A) $84,000, (B) $76,500; Owego Bridge Co., (A) $81,740, (B) $74,630; A. D. Young, (A) $84,987, (B) $77,000; Illinois Bridge Co., (A) $90,000, (B) $82,000; Penn Bridge Co., (A) $72,900, (B) $65,861. The contract was let to Penn Bridge Co. for plan B.

Grand Island, Neb.—The County Board of Supervisors is considering the report of the Committee on Roads and Bridges which recommends quite a number of new bridges.

Greenwich, Conn.—The Eastern Construction Co. of Boston has the contract to build the bridge over Mianus River at about $15,000.

Harrisburg, Pa.—It is said that the Harrisburg Bridge Co. which owns the "camel back" bridge over the Susquehanna River here, is receiving bids to rebuild the two spans that were destroyed recently.

Hartford, Conn.—At its last meeting the Common Council adopted resolutions appropriating $1,000,000 for a stone bridge across the Connecticut River, and $700,000 for the approach from the Hartford side. Both propositions will be submitted to vote at the next election.

Henrietta, Texas.—Bids, with plans and specifications, are wanted until April 14 for two bridges in Clay County, one 50 ft. and the other 60 ft. span. A. O. Ziegler, County Clerk.

Indianapolis, Ind.—It is said that the Melan Arch Construction Co. will soon submit its plans for the West Washington street bridge, and that it is probable that the Commissioner will advertise for bids early next week. The contract will be let in about four weeks.

Johnsberg, N. Y.—A bill has been passed by both branches of the Legislature and is now with the Governor, authorizing the Johnsberg Electric Light Co. to build a bridge.

Kenova, W. Va.—The Norfolk & Western is reported to have begun work on improving the Scioto Division. The sum of $500,000 has been authorized for work between Columbus and Kenova, to be used for an extra track and new bridges.

Kingston, N. C.—The House of Representatives has passed a bill authorizing the Kingston & Carolina R. R. to build a bridge over Neuse River.

Lafayette, Ind.—Bids are wanted April 9 for the steel superstructure of the bridge over Wabash River at Brown street. Melville W. Miller, County Engineer. (March 21, p. 215.)

Lebanon, Ind.—Bids are wanted until April 8 by the County Auditor, David Shockley, for 13 bridges of various designs and sizes.

London, Ohio.—The County Commissioners of Madison County propose to build an iron bridge over Oak Run Creek to be 135 ft. long. B. H. Taylor, County Auditor.

Louisiana.—A bill has been introduced in the House of Representatives authorizing the Parish of Bienville, La., to build a bridge across Loggy Bayou, in Louisiana.

Manila, Philippine Islands.—It is said contracts will be let May 1 for a rolling lift highway bridge. Address A. L. Davies, Secretary, Municipal Board, Manila.

Matthews, Ind.—The County Commissioners want bids April 22 at Marion, for a 175 ft. steel bridge at this town.

Milwaukee, Wis.—The city proposes to issue bonds for $65,000 to be used for building a bridge across the tracks of the Chicago & North Western R. R. in the Eighteenth Ward, where they are depressed.

Minneapolis, Minn.—It is possible that the County Commissioners will re-advertise the bridge repair contracts for which bids were received on March 25.

Norfolk, Va.—The State Legislature has passed the bill to permit the Norfolk Electric Ry. & Light Co. to build a bridge over Elizabeth River to Berkley.

North Clarendon, Vt.—Engineers of the Rutland R. R. are reported making surveys preparatory to building a new bridge over Cold River.

Oakland, Md.—Bids are wanted until 2 p.m., April 8, by A. G. Ross, this place, for four bridges, two of which are steel structures. Several wooden bridges are to be replaced on foundations.

Ottawa, Ont.—According to reports from Ottawa, it seems likely that the Government will build the bridge over the canal at the end of Concession street. It is not a very costly structure.

Paducah, Ky.—According to report, engineers are at work on a location for the new bridge over the Tennessee River for the Illinois Central. It will cost about $500,000.

Paterson, N. J.—The special committee on replacing the Arch street bridge will recommend that a concrete bridge be built. The distance between abutments will be 170 ft. 6 in.

Portage Du Fort, Ont.—The Lieutenant-Governor, according to report, is authorized to grant $5,000 toward the building of a bridge over the Ottawa River at this place, provided that the Government of Ontario contributes a similar sum. The total cost will be about $20,000.

Portland, Me.—The Maine Central R. R. bridge over the Penobscot River was destroyed by the recent freshet, as was also the toll bridge. Edwin D. Graves, Hartford, Conn., will arrange for the building of a temporary span in the toll bridge. Mr. Graves has been employed for some time in making plans for a new steel bridge at Bangor.

Portsmouth, Va.—It is said that plans have been approved by the Secretary of War for rebuilding a bridge over Gas House Creek to the Naval Hospital. J. J. King, President of City Council.

Pulaski, Tenn.—According to newspaper despatches from this place, 30 bridges have been washed away in Giles County.

St. John, N. B.—It is reported that the recent freshets destroyed a number of bridges and the estimated loss is $50,000.

Saugatuck, Mich.—A steel drawbridge is proposed over Kalamazoo River between Saugatuck and Douglas. The proposition will be voted upon April 7.

Seattle, Wash.—It is reported that plans have been approved for a bridge on Atlantic street.

Sherbrooke, N. Dak.—Bids are wanted April 7 for two combination bridges. T. S. Hunt, County Auditor.

South Bend, Ind.—Bids are wanted by the County Commissioners until April 29 for building a concrete arch over dry run on Pennsylvania avenue; also a plate girder bridge with concrete abutments over east race, or a combination steel and concrete arch; also an iron bridge with stone abutments on Vistula Road three miles from Mishawaka, Ind. John M. Brown, Auditor.

Sullivan, Ind.—Bids are wanted April 11 for a number of steel bridges. J. M. Lapg, County Auditor.

Tennessee.—A bill has been introduced in the U. S. Senate and House of Representatives authorizing the Tennessee Central Ry. or its successors to build a bridge across Emory River.

A bill authorizing the Nashville Terminal Co. to build a bridge across the Cumberland River in Davidson County, Tenn., has been introduced in both the U. S. Senate and House of Representatives.

Toledo, Ohio.—The Toledo Railway & Construction Co. is receiving bids until April 10 for the substructure of a bridge over Maumee River. The superstructure is let to the American Bridge Co. C. S. Davis, Consulting Engineer.

Two Rivers, Wis.—The Board of Public Works is receiving bids until April 9 for a steel girder swing bridge 140 ft. long over West Twin River. Joseph L. Kline, City Clerk.

Victoria, B. C.—It has been decided to follow out the original idea and have a steel bridge built at Point Ellice. It was estimated that a stone bridge would cost $210,000 and a concrete steel structure, $160,000.

Wilkesbarre, Pa.—It is again reported that the Lehigh Valley R. R. will build a bridge over Scott street.

Williamsport, Pa.—It is reported that plans have been made for a new railroad bridge over Lycoming Creek. The Pennsylvania R. R. some months ago lost a bridge at this point.

Winchester, Va.—Bridges will be built over Shenandoah River at Castleman's Ferry and at Berry Ferry by Supervisors of Clark County.

Other Structures.

Atlanta, Ga.—The Southern Ry. is considering building a new station at Ellen N., near Atlanta, Ga. We are told that nothing is decided.

Augusta, Ga.—The contract for the new union depot at Augusta has been let to T. O. Brown, of that city, at $140,000.

Beaumont, Texas.—Fire on March 24 destroyed the Gulf, Colorado & Santa Fe roundhouse. Several locomotives were damaged.

Bristol, Va.—The Norfolk & Southern, according to report, has informed the Board of Trade that they will soon begin work on a new passenger station in Bristol. The estimated cost is $100,000.

Brunswick, Ga.—The Brunswick Steel & Iron Co., recently incorporated with $50,000 capital, will build a plant in this city. N. Emanuel, J. J. Lott and Albert Fendig, of Brunswick, are said to be interested.

Buffalo, N. Y.—It is reported that the Pennsylvania R. R. has acquired considerable property in South Buffalo adjoining the new plant of the Lackawanna Steel Co., where it will build freight terminals.

Elgin, Ill.—The Chicago & North Western, it is announced, will build a $50,000 station in this city.

El Paso, Texas.—The roundhouse, machine shop and carpenter shop of the Chihuahua & Pacific were burned on March 26. The loss is placed at $50,000.

Fort Worth, Texas.—An officer of the Fort Worth & Rio Grande writes that there is no truth in the report that the company contemplates building shops in Fort Worth, as currently reported.

Harrisburg, Pa.—The work of remodeling the Pennsylvania R. R. passenger station in this city, it is said, will be begun within the next three weeks. Contractors are now bidding on the work.

Hartford, Conn.—A building permit has been issued to the Pratt & Whitney Co. to build an addition on the west side of Flower street.

Horton, Kan.—The car shops of the Chicago, Rock Island & Pacific at Horton, which were destroyed by fire early in February, are being rebuilt on a much larger scale, and, according to report, the new shops will have an output double that of the former shops. The company this spring will build a new boiler shop 90 x 140 ft., and the old boiler shop will be used as a machine shop.

Newark, N. J.—The North Jersey Street Ry., which controls many of the lines in the northern part of New Jersey, will build a new power-house in Newark at a cost of about $400,000.

New Orleans, La.—The New Orleans Ship Building & Dry Dock Co. is said to have let contracts for building its ship building plant, also for its equipment. It is said the total expenditure will be $2,000,000. Samuel B. McConnico, New Orleans, is Vice-President of the Ship Building Co., and also of the Crescent City Construction Co., which is doing the work.

New York, N. Y.—Plans have been made for a new public pier at the foot of South Fifth street, Brooklyn, The pier will be 300 ft. long and 40 ft. wide.

Norwich, N. Y.—A new passenger station will be built at Norwich this spring by the Delaware, Lackawanna & Western. The building will be 146 ft. x 40 ft.

Oswego, N. Y.—The Ames Iron Co. is getting ready to enlarge its plant in this city. About $25,000 will be spent for new machinery.

Pittsburgh, Pa.—The Occidental Smelting Co., of the State of Washington, has options on a site in the Pittsburgh district upon which to build a large single electric refining plant at a cost of about $800,000. This company is now building smelters on Puget Sound, Wash., at a cost of $500,000. The Allis-Chalmers Co., of Chicago, has the contract for the latter.

Port Arthur, Man.—The Canadian Northern, according to report, will build another large elevator at Port Arthur.

Racine, Wis.—The Chicago, Milwaukee & St. Paul, according to report, will build a large freight house at Racine, the new building to be of brick, one story high, 160 ft. long and 35 ft. wide, costing $10,000.

Richmond, Va.—The new erecting shop of the Richmond Locomotive Works will be 303 ft. long, 83 ft. wide and 52 ft. high. John T. Wilson, of Richmond, is the contractor.

Scranton, Pa.—There have been numerous reports recently that the Delaware, Lackawanna & Western has decided to enlarge its shops in the vicinity of Scranton, and that car shops will be located at Taylor, southwest of Scranton. It is also said that the plans have been made for the car shops.

Springfield, Ohio.—An officer of the Cleveland, Cincinnati, Chicago & St. Louis writes that no decision has been reached in regard to the improvements proposed at Springfield. It is possible that a new roundhouse will be built, and reports state that machine shops are proposed; also a new passenger station at a cost of $75,000.

Washington, D. C.—A bill has been introduced in the United States Senate authorizing the construction of a union station in Washington to cost $4,000,000.

Wheatland, Pa.—The executive committee of the Continental Iron Co., operating the Wheatland Rolling Mill, has ordered improvements costing $200,000. Four large heating furnaces will be installed, a universal plate mill built; also several finishing mills.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xix.)

The Engineers' Club of Philadelphia.

A business meeting of the Club will be held on Saturday, April 5, at 8 o'clock p. m. Paper, "Changes in the Manufacture of Pig-Iron." Illustrated. By John Birkinbine. (To be followed at the next meeting by a paper on "Modern Developments in the Production of Open Hearth Steel." Illustrated. By James Christie.)

American Society of Mechanical Engineers.

The next regular meeting of the American Society of Mechanical Engineers will be held in the new building of the American Institute of Technology, Boston, Mass.,

May 27 to 30 inclusive. The Hotel Brunswick has been selected as hotel headquarters. The programme for the meeting has not yet been announced except that on May 30 there will be a reception at Harvard University.

American Society of Civil Engineers.

On Wednesday, April 2nd, at the business meeting of the Society, two papers were presented for discussion; one by Marsden Manson, M. Am. Soc. C. E., entitled "A Brief History of Road Conditions and Legislation in California," and the other by Charles C. Wentworth, M. Am. Soc. C. E., on "Line and Surface for Railway Curves." These papers were printed in the *Proceedings* for February, 1902.

The Railway Club of Pittsburgh.

A regular meeting of this Club was held at the Hotel Lincoln, Pittsburgh, Pa., on Friday, March 28. Discussion was held on the two subjects presented at the previous meeting, "The Locomotive," by Ira C. Hubbell, and the "Power Question—Locomotive Repair Shops," by R. W. Stovel. The new subject presented was "Elasticity in Draft Gear," by R. A. Parke, of the Westinghouse Air-Brake Co. Extracts from the paper are given in another column.

Canadian Railroad Club.

The next meeting of this new club will be held on April 8 in Montreal, Que., at which time a paper will be presented by Mr. S. King, Master Car Builder of the Intercolonial Ry., on the "Advantages and Disadvantages of the Standard Box Car." There will also be a lecture on "Coal Combustion," with limelight views. The club has started off with a membership of 175. The meetings will be held on the second Tuesday of each month, except during June, July and August. M. P. Kelly, Chief Clerk of the Car Department of the Canadian Pacific Ry., Montreal, is Secretary.

PERSONAL.

—Mr. James McKinney, of Aledo, Ill., a member of the Railroad and Warehouse Commission of Illinois, has resigned.

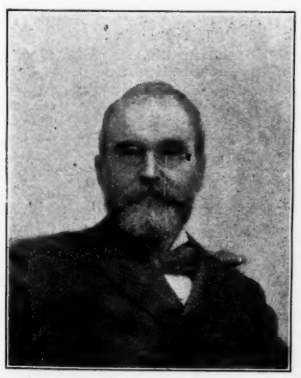
—Rear Admiral Mordecai T. Endicott, Corps of Civil Engineers, U. S. Navy, has been nominated by the President for a second term as Chief of the Bureau of Yards and Docks, Navy Department, for four years from April 4 next. Admiral Endicott was the first officer of his Corps to serve as a Chief of Bureau, and his administration during the past four years has been very successful.

—Mr. David Patterson, the new Master Mechanic of the New Mexico and Rio Grande Divisions of the Atchison, Topeka & Santa Fe, has been in active railroad service for 34 years. He was for 29 consecutive years with the Union Pacific, starting as a machinist. He later became General Foreman, Division Foreman and Master Mechanic. Leaving the Union Pacific in 1897 he entered the service of the Kansas City Southern and has since been Master Mechanic at Pittsburgh, Kan.

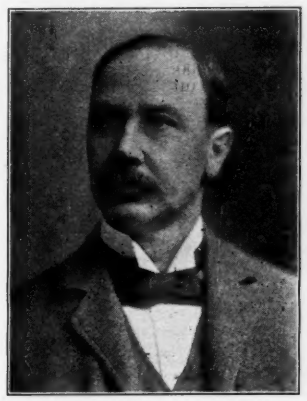
—Mr. Edwin Hawley, for many years the New York City traffic representative of the Southern Pacific, latterly with the title of Assistant General Traffic Manager and now President of the Iowa Central and Minneapolis & St. Louis Railroads, and Mr. F. H. Davis, First Vice-President and Treasurer, respectively of the last named companies, have formed a copartnership under the name of Hawley & Davis, for the purpose of dealing in securities on the New York Stock Exchange, of which Mr. Hawley has been a member for some years.

—Mr. J. G. Hartigan, who in March last became Division Superintendent of the St. Louis, Iron Mountain & Southern at Little Rock, Ark., was born in Franklin County, Vt., in 1849. His railroad service dates from 1865, when he began as a telegraph operator on the Chicago & Alton. He served this company for five years as agent and operator and from 1870 to 1880 was train despatcher. In 1881 Mr. Hartigan organized the transportation department of the Chicago & Western Indiana. Then for four years he was trainmaster on the Chicago, Milwaukee & St. Paul, leaving this company in 1885 to assume the Superintendency of the Missouri, Kansas & Texas (in Texas). The following year he returned to the Chicago, Milwaukee & St. Paul as Assistant Superintendent and remained there until 1890, when he became Superintendent of the Chicago Division of the Illinois Central and in October of the same year (1890) he was promoted to the position of General Superintendent of the Northern and Western lines and discharged these duties until Jan. 1, 1901, when he left to become Assistant to the Third Vice-President of the Santa Fe. The following July Mr. Hartigan was appointed Superintendent of the Northern Texas lines, and held this position until his new appointment as above.

—Mr. Aaron French died in Pittsburgh on the morning of March 24. He was one of the famous old supplymen and was known to railroad men throughout the length and breadth of the United States. He was born March 23, 1823, at Wadsworth, Ohio. He had to stop going to school when he was 12 years old, and at 13 began to learn the trade of a blacksmith. When he was 20, he had an opportunity to again go to school, this time at an academy in his native town, which he seems to have been able to attend only about a year. When he was about 26, he entered the service of the Cleveland, Columbus & Cincinnati Railroad at Cleveland, Ohio, by which company he was employed in various bridge and smith work; and about 1855 or 1856 he was put in charge of the shop of the Cleveland & Pittsburgh Railroad at Wellsville and later became Superintendent of the smith shop of the Racine & Mississippi Railroad at Racine, Wis. During his work there he conceived the idea of making light elliptic springs for passenger cars and his springs were first tried on the Pennsylvania Railroad between Philadelphia and Pittsburgh. About 1864 he began the manufacture of car springs at Pittsburgh in company with Mr. Calvin Wells. This was the beginning of the great industry in which he built up a fortune, and at the time of his death he was Chairman of the Board of the Railway Steel Spring Co., a combination of most of the important spring makers in the country.



—Mr. R. D. Smith, Division Master Mechanic of the Chicago, Burlington & Quincy at Chicago, has been appointed Superintendent of Motive Power of the Burlington & Missouri River R. R. in Nebraska, taking effect April 1. Mr. Smith has had an active part in the work of the Western Railway Club, the Master Car Builders' Association and Master Mechanics' Association, and his many friends will be glad to know of his promotion. Mr. Smith was born in New York City and was educated at Albany, N. Y. He learned the trade of machinist in the shops of the Delaware & Hudson, and then went West and took service with the Kansas City, St. Joseph & Council Bluffs as a gang foreman. Later he was fireman and then engineer, and when the road was absorbed by the Chicago, Burlington & Quincy, Mr. Smith was made successively Assistant Foreman of the machine shop at Aurora, Ill.; Foreman at Aurora and General Foreman in charge of the locomotive and car department at Chicago. In July, 1888, Mr. Smith was appointed Master Mechanic at Chicago, which position he has held up to the present time.



ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—The jurisdiction of W. S. Haines, Superintendent of Motive Power, has been extended over the New Castle Division, effective April 1.

Baltimore & Ohio Southwestern.—J. B. Carothers has been appointed Division Engineer, with headquarters at Chillicothe, Ohio, succeeding J. G. Bloom, and Mr. Carothers is succeeded as Division Engineer at Flora, Ill., by E. Stimson.

Blackwell, Enid & Southwestern.—L. D. Button, General Superintendent of the Blackwell, Enid & Texas, has been appointed Superintendent of the B., E. & S. W., succeeding R. Holland, Acting Superintendent.

Boston & Maine.—Stuart H. McIntosh has been appointed Assistant General Auditor, succeeding Joseph W. Richards, resigned. Mr. Richards goes to Chicago as Auditor of the Chicago Telephone Co.

Burlington & Missouri River in Nebraska.—R. D. Smith, heretofore Division Master Mechanic of the Chicago, Burlington & Quincy, has been appointed Superintendent of Motive Power of the B. & M. R. in N., effective April 1.

Canadian Pacific.—Frank Dillinger has been appointed Acting Superintendent of the Chapleau and White River Sections, succeeding T. Hay, who has become Claims Agent of the Lake Superior Division.

Central New England.—J. F. Hedden has been appointed Superintendent and Purchasing Agent, with headquarters at Hartford, Conn., succeeding W. J. Martin, resigned. The office of General Traffic Manager has been abolished, and D. A. Geraty, General Freight Agent at Hartford, Conn., will have charge of all traffic matters, effective April 1.

Central Vermont.—J. E. Dalrymple, formerly Assistant to the General Manager of the Grand Trunk, has been appointed General Freight Agent of the C. V., with headquarters at St. Albans, Vt.

Chattanooga Southern.—A. D. Folmer has been appointed Master Mechanic, with headquarters at the shops at Alton Park, Tenn., effective April 1.

Chicago & North Western.—L. N. Costley has been appointed Assistant Division Superintendent at Ashland, Wis., succeeding F. O. Tarbox, and Mr. Costley is succeeded as Assistant Division Superintendent at Kaukauna, Wis., by J. Lepple.

Chicago, Burlington & Quincy.—A. J. Cota, heretofore Division Master Mechanic at Beardstown, Ill., has been appointed Master Mechanic of the Chicago Terminals at Chicago, Ill., succeeding R. D. Smith, resigned. Taylor L. Smith succeeds Mr. Cota, effective April 1. (See Burlington & Missouri River in Nebraska.)

Delaware, Lackawanna & Western.—W. H. Van Wie has been appointed Engineer of Track, with headquarters at Hoboken, N. J.

Denver & Rio Grande.—M. H. Rogers, Consulting Engineer, has resigned and that position has been abolished.

A. Struthers, Master Mechanic at Grand Junction, Colo., has resigned.

Gulf, Colorado & Santa Fe.—T. B. Coppage has been appointed Acting Division Superintendent of the Southern Division, with headquarters at Temple, Texas, succeeding W. B. Scott.

Illinois Central.—O. M. Dunn, heretofore Superintendent at New Orleans, La., has been appointed Assistant General Superintendent, with headquarters at Memphis, Tenn., and C. F. Scaife succeeds Mr. Dunn at New Orleans.

G. A. Clark, heretofore Superintendent of the Omaha Division, has been transferred as Superintendent of the Springfield Division, and C. K. Dixon succeeds Mr. Clark at Fort Dodge, Iowa, and Mr. Dixon in turn is succeeded by Mr. D. Gilleas as Superintendent of the Cherokee Division, with headquarters at Cherokee, Iowa.

Illinois Southern.—M. L. Morris has been appointed Engineer Maintenance of Way.

Iowa Central.—G. S. Batty, General Passenger Agent, with headquarters at Marshalltown, Iowa, has resigned.

Jacksonville & St. Louis.—W. E. Crane, heretofore General Freight Agent, has been appointed General Manager, with headquarters at Jacksonville, Ill., succeeding C. M. Stanton, deceased.

Los Angeles.—Geo. J. Kuhrts has been appointed Chief Engineer, succeeding the late F. W. Skinner.

Macon, Dublin & Savannah.—T. D. Catlin has been elected President, succeeding J. T. Wright, who will continue as General Manager.

Minneapolis & St. Louis.—R. G. Brown, Assistant General Freight Agent, with headquarters at Minneapolis, Minn., has resigned.

New York Central & Hudson River.—C. H. Quereau has been appointed Superintendent of Shops at West Albany. W. J. McQueen, heretofore Assistant Master Mechanic of the Hudson, Harlem and Putnam Divisions, has been appointed Master Mechanic, succeeding S. W. Simonds, resigned. The position formerly held by Mr. McQueen has been abolished. Charles E. Buchholz has been appointed Division Engineer of the Middle Division, with headquarters at Albany, N. Y., succeeding J. C. Irwin, promoted. Henry C. Thompson succeeds Mr. Buchholz as Division Engineer of the River Division, with headquarters at Weehawken, N. J. Homer N. McGill has been appointed Supervisor of Track, with headquarters at Hudson, N. Y., succeeding C. J. Coon, resigned. All changes to take effect April 1.

Northern Central.—H. P. Lincoln, heretofore Principal Assistant Engineer of the Buffalo & Allegheny Division of the Pennsylvania, has been appointed Division Superintendent of the N. C., with headquarters at Elmira, N. Y., succeeding C. A. Preston. (See Pennsylvania.)

Pennsylvania.—Cecil A. Preston has been appointed Superintendent of the Eastern Division of this company and Superintendent of the Susquehanna Division of the Northern Central, with headquarters at Williamsport, Pa., succeeding E. B. Westfall, deceased, effective April 1.

We are officially informed that the rumors involving the retirement of the General Manager and numerous other changes are entirely without foundation.

St. Louis & San Francisco.—J. Forster has been appointed Master Mechanic, with headquarters at Kansas City, Mo.

Southern.—D. Brown has been appointed Master Mechanic of the St. Louis-Louisville Lines, with headquarters at Princeton, Ind., succeeding C. L. Petriken, resigned.

W. B. Ryder, Division Superintendent at Charlotte, N. C., has resigned.

Tennessee Central.—R. L. Farrell has been appointed Master Mechanic.

Virginia & Southwestern.—Daniel Davies, heretofore Auditor, has been appointed General Manager, succeeding J. L. Brass, resigned, and W. B. Bowles succeeds Mr. Davies as Auditor.

Yazoo & Mississippi Valley.—M. Gilleas, heretofore Assistant General Superintendent of the Illinois Central, has been appointed Third Vice-President and General Superintendent of the Y. & M. V., with headquarters at Memphis, Tenn.

Wabash.—G. W. Mudd, Division Master Mechanic at Moberly, Mo., has resigned.

Weatherford, Mineral Wells & Northwestern.—G. E. Littlefair, Assistant General Freight and Passenger Agent, has resigned.

West Virginia Central & Pittsburgh.—C. B. Scott, heretofore Acting Engineer Maintenance of Way, has been transferred to the position of Assistant Engineer.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

AMERICAN COAL & RAILWAY.—This company was incorporated in Newark, N. J., March 28, by C. E. Wellborn, of Weston, N. J.; C. B. Hall, Cedarhurst, L. I., and Richard Shann, of London, Eng. The purposes of the company are general and nothing further is announced than its purpose to mine coal, manufacture coke and build railroads.

ATCHISON, TOPEKA & SANTA FE.—After a special meeting of the stockholders March 19, an amended charter was filed with the Secretary of Oklahoma Territory and approved by him, providing for building seven more lines known as Nos. 1, 3, 4, 7, 10, 12 and 15. A list of these lines is given below. All of them except No. 15 were provided for in part by a charter secured Aug. 27 last. Line No. 1, from Guthrie east to Cushing, in Payne County, a distance of 50 miles; line No. 3, from Ripley, in Payne County, northeast via Stillwater, Pawnee and Ralston, to the Arkansas River, a distance of 35 miles; line No. 4, from line No. 3, in Pawnee County, north through the Osage Nation, to Elgin, Kan., 38 miles; line No. 7 from line No. 4, in Pawnee County, northwest through the Osage and Kansas Indian reservations, to the Kansas State line, 28 miles; line No. 10 from line No. 3, in Pawnee County, south through Pawnee, Payne, Lincoln and Pottawatomie Counties to line No. 12 in the Chickasaw Nation, 115 miles; line No. 12 from line No. 10, in Chickasaw Nation, southwest to Paul's Valley, on the main line of the Gulf, Colorado & Santa Fe, 15 miles; line No. 15 from line No. 4, in the Osage Nation, northwest to Newkirk, in Kay County, 24 miles. (Construction Supplement, March 14, 1902.)

ATLANTIC & BIRMINGHAM.—Announcement is made that the proposed extension from Cordele, Ga., on toward Birmingham, will begin at once. The distance from Cordele to Oglethorpe, Ga., is about 30 miles, and it is proposed to build this link first. The road from Fitzgerald to Cordele is expected to be opened by April 15. Geo. D. Wadley, of Waycross, Ga., is Vice-President.

BALTIMORE & OHIO.—A cut-off about 11 miles long is reported authorized between Cherry Run and Martinsburg, W. Va. It will be built to avoid the heavy grade upon the existing route.

BARBERTON, AKRON & EASTERN (ELECTRIC).—Contract has been let to John C. Carland, of Toledo, Ohio, for this new electric line between the towns named, a total of about 22 miles. Fourteen miles of grading and several bridges are to be completed by July 1. (Construction Supplement, March 14, 1902.)

BELLAIRE, ZANESVILLE & CINCINNATI.—The International Coal Co., of Woodsfield, Ohio, was organized March 19 as a preliminary step, it is said, to the reorganization of this railroad, which is a narrow gage line 110 miles long between Bellaire and Mill Run, Ohio. It is said that the road is to be made standard gage and that a number of short spurs are to be built into adjacent coal lands owned by the International Coal Co.

CHATEAUGAY.—It is said that this company, owning a railroad extending from Plattsburg, N. Y., to Saranac Lake, 73 miles, and lessee of the Saranac & Lake Placid line, which is 10 miles long, is to change its tracks to standard gage, in place of the present 3-ft. gage.

CENTRAL OF ALABAMA.—Surveys were reported March 24 for the proposed terminal site in Decatur, Ala., of this new line to be built between Decatur and Jasper, 76 miles. The permanent survey between Decatur and Jasper has been begun and grading is to be carried on while the survey is being made. (Construction Supplement, March 14, 1902.)

CHICAGO, MILWAUKEE & ST. PAUL.—Work was reported begun March 24 on the second track for the La Crosse Division between Brookfield Junction, Wis., and Camp Douglas. It is said that 90 miles or more of second track work will be completed this year, and that the division from Brookfield to La Crosse, 182 miles, will be

completed next year. It is planned to spend $1,500,000 this year in double-tracking. (Jan. 17, p. 49.)

Chicago, St. Paul, Minneapolis & Omaha.—An officer states that press reports to the effect that surveys are being made for a new line in South Dakota, and for a second track between Sioux City and LeMars, Iowa, are incorrect.

Colorado & Southern.—An officer denies that an extension of the line to be known as the Denver & Cripple Creek Short Line is to be built, as currently reported.

Cumberland Railway & Coal Co.—An officer denies the current report that extensions are contemplated between Advocate, N. S., or from Parrsboro to Advocate, N. S.

Dawson.—In regard to the new line from Tucumcari, N. Mex., to Dawson, N. Mex., 132 miles, which was surveyed last year, an officer writes that contract has been let to Geo. S. Goode & Co., of Lockhaven, Pa. (Construction Supplement, March 14, 1902.)

Eastern Ohio Traction Co.—See Railroad News column.

Federal.—Articles of incorporation were filed March 28 at Rapid City, S. Dak., for this company by Wm. T. Coad, of Rapid City; J. H. Muhlke, of Chicago, and others. The objects of the company are not stated.

Hillsboro & Northwestern.—Contract is reported let to Manning & Allen for a standard gage road five miles long from Hillsboro, in Viroqua County, Wis., to Union Center, Juneau County, on the Chicago & North Western. This project was originated in June, 1900, and was then known as the Hillsboro & Eastern; and some grading has been done. F. A. Pinch is President.

Hollins, Sylacauga & Heflin.—Work is reported in progress by Wagnon Bros., of Sylacauga, Ala., extending this road which has been narrow gage and has been operated entirely to haul lumber, but is now to be made standard and will connect the towns named in Alabama, a total distance of about 55 miles. John L. Kane, of Hollins, Ala., is President.

Hudson River Traction.—This company was incorporated in Trenton, N. J., March 22, with broad privileges, including tunnel work and railroads on the surface of the ground and beneath it. The objects of the incorporation beyond this general description are not stated. The office is to be at the entrance of the North River tunnel at Dempsey avenue, Edgewater.

Illinois Central.—Further information in regard to the new line to be built between Paducah, Ky., and Cairo, Ill., is at hand showing that the line will be 32 miles long, from the city limits of Paducah to the Kentucky end of the railroad bridge across the river at Cairo. The estimated cost of the work is $915,000, and 20 engineers are reported to be working on the final survey. (March 21, p. 217.)

An officer denies the current press report that contracts have been let for an extension from Eldorado to Cave-in-Rock, Ill., and Marion, Ky.

International & Great Northern.—This company is to file an amendment to its charter in Texas authorizing it to build from Itasca, Tex., to Dallas, 30 miles; from Navasota, Tex., to Madisonville, 50 miles; from Columbit to Bay City, 40 miles; from Houston by way of Beaumont to Orange, about 100 miles. It is said that charter is also to be obtained in Louisiana for a continuance of this last named extension to New Orleans.

See also Railroad News column.

James Bay.—This new line between Quebec Siding, on the Canada Atlantic, and Parry Sound, Ont., five miles long, is now in operation by the contractors, Johnston, Beveridge & Co., and is to be turned over shortly to Mackenzie & Mann. It is said that the company will continue the line this year as far as Magnetawan River, 34 miles north of Parry Sound, on the way to Sudbury.

Kettle Valley Lines.—April 12 is now announced as the date for opening the new line from Grand Forks, B. C., to Republic, Wash. The line is about 42 miles long, and separate companies are incorporated under different titles on the two sides of the International boundary. The general name of the company is as above. Hon. J. R. Stratton, Provincial Secretary, is President, and may be addressed at Toronto.

Ligonier Valley.—This railroad, now in operation between Latrobe and Ligonier, Pa., 11 miles, is to be extended from Ligonier, up Mill Creek and Hannah's Run to a coal field recently purchased by the Oliver & Snyder Steel Co. of Pittsburgh.

Louisiana Roads.—At a meeting of the directors of the Avoyelles Lumber Co., March 17, it was decided to build a lumber road from Marksville, on the Texas & Pacific, to the Red River, 18 miles, passing through timber lands of the company in Avoyelles County. E. V. Babcock, of Babcock, Ga., is interested.

Macomb & Western (Electric).—Franchise was granted this company in Illinois March 17 to build from the north line of Schuyler County to Rushville, and from Rushville to Beardstown and Mount Sterling, a total of 40 miles.

Mississippi Roads.—Surveys for a lumber road are reported between Isney, Ala., and Waynesboro, Miss., 15 miles west. It is said to be the intention of those interested to extend it later on to the Tombigbee River. It will be operated in connection with a sawmill and hardwood manufactory to be owned by W. C. and C. P. Wetherbee, who may be addressed at Waynesboro.

Montreal Subway.—Incorporation is being asked for a subway under the St. Lawrence River from Montreal to the South Shore. It is designed for general purposes, including electric and steam railroad and passenger traffic. Permission to charge tolls and to lease the subway is asked. Among the incorporators are: Robert Reford, of Montreal, and Hon. Lyman Jones, of Toronto.

New York City Interborough (Electric).—This company was incorporated at Albany, March 24, to build a street surface railroad about 40 miles long. The route is to start at Broadway and 155th street and run through a number of upper West Side streets, with lines to the Hudson and Bronx.

Norfolk & Western.—An officer writes in regard to current reports that a line was to be built between Dingess Station and Logan, Ky., that no such project is being undertaken by the Norfolk & Western. The territory is being looked over by other parties with a view to opening up coal lands. (March 21, p. 218.)

North Jersey Street.—At the annual stockholders' meeting in Jersey City March 24, it was stated that the company plans to spend $1,000,000 in betterments of the line, including a belt line 17 miles long from the Pennsylvania Station in Jersey City to Bergen Point.

Oregon Short Line.—An officer writes that the programme for 1902 is as follows: General betterments will cost approximately $2,500,000, including rectification of grades, ballasting, laying heavier rail, new equipment, steel bridges, concrete culverts, new buildings, etc. Work is now in progress on the Pocatello shops which will cost in the neighborhood of $600,000. If the Leamington cut-off, 115 miles long, should be built, it will cost approximately $2,500,000, and it is thought probable that it will be. What is referred to as the California Extension from Calientes, Nev., to Barstow, Cal., is also projected. This line will be over 300 miles long and would probably cost, if built, between $7,000,000 and $8,000,000, but construction has not yet been authorized.

Ontario Roads.—The following roads were incorporated by the Ontario Legislature at its last session: Temiscamingue & Northern Ontario; Canada Central; Canada Western; Durham Switch Line; Essex & Kent Radial; Fort Erie Ferry; Great Lakes; Haliburton, Whitney & Mattawa; Hamilton, Ancaster & Brantford; Huron & Bruce; Huron, Bruce & Grey Electric; Lake Erie & Detroit River (act to legalize certain by-laws); Lake Superior, Long Lake & Albany River; Lambton Central Electric; London Street; Middlesex & Elgin Interurban; Morrisburg Electric; Nepigon Ry.; New Ontario Ry.; Ontario Electric; Ontario, Hudson's Bay & Western; Pacific & Atlantic; Pembroke Southern; Peterborough Radial; Port Dalhousie, St. Catharines & Thorold Electric; Sandwich, Windsor & Amherstburg; Sarnia Street; South Western Traction; Windsor, Essex & Lake Shore Rapid; Woodstock, Thames Valley & Ingersoll Electric.

The following roads were incorporated at the last session of the Quebec Legislature: Matane & Gaspe; North Shore Power (Electric); County of Levis; Kamon-Tem Littoral Electric; Shawinigan Falls Terminal.

Pittsburgh & Lake Erie.—It is said that this road is to be extended from its present terminus at Fayette City, Pa., to a connection with the West Virginia Central & Pittsburgh at Parsons, W. Va., where a new line is to be built to Staunton, Va., to connect with the Chesapeake & Ohio. About 140 miles of survey is involved and this is said to have been ordered.

Red River, Texas & Southern.—A circular announces the completion of this new line between Sherman and Fort Worth, Texas, 85 miles. It is a St. Louis & San Francisco property and will be operated by B. F. Yoakum, President; L. B. Comer, Vice-President and Superintendent; J. S. Jones, Auditor; L. O. Williams, Treasurer, and other officers.

San Pete Valley.—It is said that this company will undertake a number of betterments on its line during the year, including the laying of 80-lb. rails and the purchase of additional rolling stock. Theo. Bruback, of Salt Lake City, is General Manager.

Seaboard Air Line.—In reference to press reports to the effect that a line is to be built to open up great coal fields in Kentucky and Virginia, with a connection to tidewater, an officer writes that the Seaboard Air Line is not interested and has no connection with the proposition, nor has it secured the line between Johnson City and Huntdale, Tenn., as also reported.

Texas Central.—Grading on the extension between Waco and Ross, Texas, 10 miles, began on March 25. It is said that $40,000 is to be spent for terminal improvements in Waco. (Feb. 28, p. 154.)

Toledo, St. Louis & New Orleans.—This railroad was incorporated March 26, to build from a point in Shelby County, Ill., to a point on the Ohio River in Massac County. The projectors say that the prospects for immediate building are good. The incorporators are: C. E. Hilts, of St. Louis; H. B. Pierce, Golconda, Ill.; J. R. Morrison, Burnt Prairie, Ill., and others.

Western Illinois.—This company was incorporated recently in Illinois to build from Dahinda in Knox County, northward through Stark, Marshall and Putnam Counties, with headquarters at Galesburg.

GENERAL RAILROAD NEWS.

Albany & Hudson Railway & Power.—Reorganization of this property without foreclosure has been arranged by a plan which provides for deposit with the Colonial Trust Co. of the $2,500,000 5 per cent. bonds, and also of the 5 per cent. notes given for coupons due last September. A new series of bonds aggregating $1,800,000 4½ per cent. 40-year gold bonds are authorized, of which $1,500,000 par value are to be issued and the remainder reserved. The capital stock which is now all common is to be divided into $1,800,000 5 per cent. non-cumulative preferred, both as to dividend and as to assets in case of dissolution, and $700,000 common stock. The new bonds and the preferred stock will be issued to take up the old bonds and stock outstanding, and the new common stock will be divided pro rata among the holders of the outstanding capital stock. Additions and betterments are also provided for. In case the new bonds are not sold by the committee, the present bondholders will receive in new bonds 51.92 per cent. of their present holdings, payment for the remainder being in preferred stock. In case the bonds are marketed, the present bondholders will receive $478 cash and $522 preferred stock for each bond held. This plan is dependent upon deposits of enough bonds and shares in the judgment of the committee.

Chesapeake & Cumberland.—The bill introduced into the Maryland Legislature March 12 to give this company enlarged powers which would put it in position to obtain possession of the Chesapeake & Ohio Canal, was killed on March 29. Had the bill passed, the West Virginia Central & Pittsburgh, in whose interest it is understood the purchasers were working, need not have depended upon the acceptance of the Fuller bid for the Western Maryland. (Railroad Construction, March 21, p. 217.)

Colorado & Southern.—Announcement is made that Edwin Hawley and his associates have secured a controlling interest in this property. The mileage involved and leased, exclusive of the interest in the Fort Worth & Denver System, is about 1,140 miles. The railroad is capitalized at $48,000,000, $31,000,000 being common stock, $8,500,000 first preferred, and $8,500,000 second preferred, the two latter issues being entitled to dividends at the rate of 4 per cent. non-cumulative.

Columbus, Lima & Milwaukee.—This property, which extends from Lima, Ohio, to Defiance, was sold at foreclosure March 25, to John D. Rockefeller for $285,000. It is said that the line may be extended, as it was originally intended to run from Columbus to Saugatuck, Mich. (Feb. 14, p. 122.)

Des Moines, Iowa Falls & Northern.—At a recent meeting of the stockholders, an increase in capital stock from $50,000 to $1,200,000 was authorized. Track laying is reported resumed on the line and it is said that the track will soon be completed to McCallsburg, Iowa, where the grading stopped last fall. (March 21, p. 217.)

Dominion Securities.—At a meeting of the shareholders March 10, the proposition to increase the stock from $1,500,000 to $3,000,000 was approved. No conclusion has as yet been reached as to the application of this increase, which is to be considered again at a meeting in the near future.

Duluth, Virginia & Rainy Lake.—This company has filed a mortgage to the Minnesota Loan & Trust Co., trustee, to secure $2,000,000 5 per cent. bonds, secured in part at the rate of $15,000 per mile, single track mileage, and for the remainder by rolling stock. Sixteen miles of this line is now reported completed. It was incorporated April 3, 1901, and is under contract for its entire projected distance from Virginia, Minn., to Koochiching, 100 miles, to the Minnesota Land & Construction Co.

Eastern Ohio Traction.—Consolidation of the Cleveland & Eastern, Chagrin Falls & Eastern and Cleveland & Chagrin Falls Traction Companies, voted at a joint meeting of stockholders Jan. 20, has been effected under the above title. Of the $2,500,000 bonds and a like amount of capital stock, constituting the authorized capitalization, $1,600,000 of bonds are reserved to take up outstanding obligations and the remainder will be issued in part for completing the lines of the company. The total mileage, when this is done, will be about 100 miles in the vicinity of Cleveland, Ohio.

Erie.—A new agreement between the Erie and the Chesapeake & Lake Erie is reported to have been drawn up, subject to adoption by the two companies. In accordance with this, the Pittsburgh & Lake Erie will operate its own trains through from Pittsburgh to Cleveland, and the Erie will operate its own trains, to avoid the present congestion of traffic at the Youngstown terminals.

Erie & Central New York.—This property, extending from Cortland, N. Y., to Cincinnatus, 18 miles, and projected beyond, which was sold under foreclosure March 29, was bought by W. W. Montgomery, 25 Broad street, New York, for $150,000. The names of the parties behind the purchase were not made public.

Great Northern.—Additional Montana Central first mortgage guaranteed 5 per cent. gold bonds of 1937 have been listed at the Stock Exchange to the amount of $1,300,000, making the total listed to date $4,000,000. This completes the issue allowable under the present mortgage, which covers 260 miles of main line, with side track and rolling stock additional. The bonds are guaranteed by the St. Paul, Minneapolis & Manitoba.

Illinois Central.—This company is reported to have secured control of the Kentucky Western, which extends from Dixon to Blackford, Ky., 19 miles, and which was opened in January, 1901. The Legislature has passed an act enabling the Illinois Central to take over the property, which has heretofore been operated under a traffic arrangement. The transfer is to be made as soon as the law goes into effect.

International & Great Northern.—The Texas Railroad Commission on March 25 granted this company authority to issue $780,000 of bonds on 39 miles of road between Spring and the Navasota River. With this issue the company completes its issuance of bonds on the entire line from Spring to Waco, including the Calvert branch, a total of 184 miles. The total amount of bonds issued on this mileage is $3,680,000, at the rate of $20,000 per mile. The company has made no application for authority to issue bonds on the extension north from Waco to Fort Worth. This extension has been graded for a distance of 55 miles to Mertens, Hill County.

Missouri, Kansas & Texas.—Sale of the Eastern Oklahoma line running from Ralston to Ripley, Okla. T., 50 miles, to the Missouri, Kansas & Texas, was reported March 24. The new line will constitute a link in the extension from Coffeyville, Kan., to Guthrie, Okla. T.

New Orleans & Northeastern.—At a meeting of stockholders on March 5, it was voted to increase the authorized capital stock $1,000,000, and to create $8,000,000 4½ per cent. general mortgage bonds and $1,500,000 4½ per cent. income bonds to retire outstanding obligations and provide for betterments. This is part of the plan agreed to by the Alabama, New Orleans & Pacific Junction Railways Co., Ltd., as holder of this company's obligations for reorganizing the finances of the New Orleans & Northeastern. The former company has agreed as part of the plan to exchange its holdings of $4,900,000 6 per cent. first mortgage gold bonds for a similar amount of 4½ per cent. gold mortgage bonds. The *Commercial and Financial Chronicle* gives the following résumé of the purposes of the new bond issue.

To retire the 6 per cent. mortgage bonds held by Ala., N. O. T. & P. Junc. Rys.	$4,900,000
To pay off or retire the remaining first mortgage 6s held by other parties	100,000
To be reserved for paying off or retiring prior lien mortgage due Nov. 1, 1915	1,320,000
Leaving in treasury for future requirements $500,000; to be used shortly for additional rolling stock and for additions and improvements to the property	1,680,000
Total authorized issue of new 4½ per cent. bonds	$8,000,000

New York Central & Hudson River.—Stockholders are notified of their privilege to subscribe for the new stock at $125 a share, to the extent of 15 per cent. of their holdings. Warrants specifying the amount for which each stockholder may subscribe will be sent to stockholders on April 1.

St. Louis, St. Charles & Western (Electric).—This company has authorized a bond issue of $600,000 30-year 5 per cent. gold bonds, of which $500,000 are to be issued on the present property and $100,000 is to remain in the treasury. The Colonial Trust Co. of St. Louis will be trustee.

Southern.—Transfer of the Itta Bena branch from Webb, Tenn., to Itta Bena, 60 miles, to the Yazoo & Mississippi Valley, was made March 17. The transfer has developed considerable opposition and the matter is likely to be carried into the courts.

Zanesville Terminal.—This property was sold at Zanesville, Ohio, March 22, to R. R. Rogers, of New York, representing the bondholders. The line extends from Muskingum to Spangler, and from South Zanesville to the Baltimore & Ohio crossing, with a third short spur, and is approximately five miles long. The price paid was $92,000.